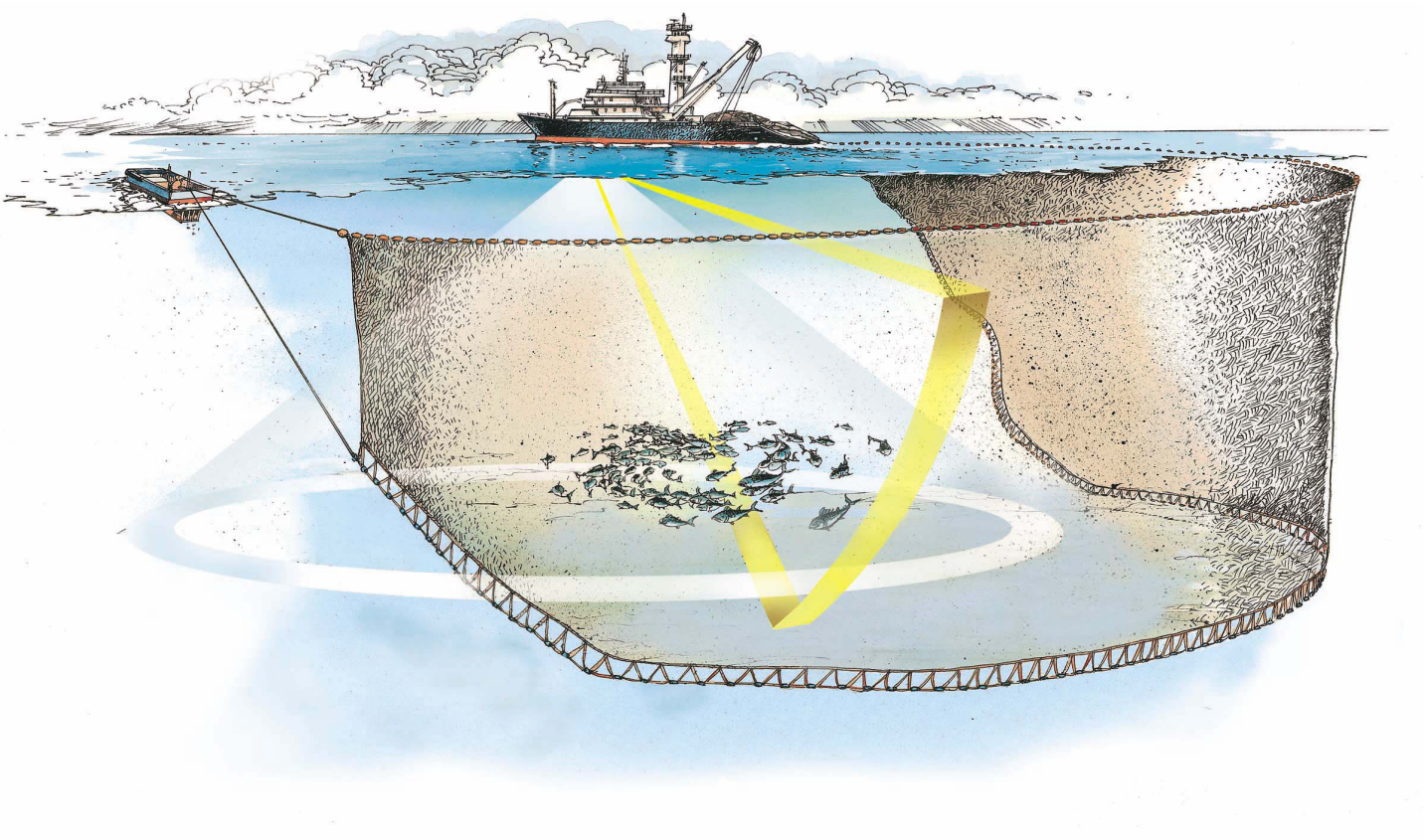
Installation manual

Simrad SX90
Fish finding sonar



Simrad SX90

Installation manual

This manual provides you with the basic information required to install the Simrad SX90. For more detailed information about the practical use of the product, refer to the *Simrad SX90 Operator manual* or the *Simrad SX90 Reference manual*.

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Rev.B	04.07.2008	Added chapter “Technical specifications”. Added information about mandatory UPS systems. Several other minor changes.
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Rev.D	13.01.2010	Single computer system implemented. External synchronisation described.
Rev.E	25.08.2010	New procedures for Processor Unit backup and restore using USB memory devices. See *Processor Unit backup and restore* on page 167. Hull Unit and Motor Control Unit familiarization illustrations added. See *Hull unit installation* on page 45.

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Kongsberg Maritime AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to install, operate or work on the equipment.

Kongsberg Maritime AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Support information

If you require maintenance or repair, contact your local dealer. You can also contact us using the following address: contact@simrad.com. If you need information about our other products, visit our web site. On the web site you will also find a list of our dealers and distributors.

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Buoy telegrams 242
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DBS Depth below surface 243
DBT Depth below transducer 243
DPT Depth 244
GGA Global positioning system fix data 244
GLL Geographical position latitude/longitude 245
HDG Heading, deviation and variation 245
HDM Heading, magnetic 246
HDT Heading, true 246
MWD Wind direction and speed 247
MWV Wind speed and angle 247
RMC Recommended minimum specific GNSS data 247

VBW Dual ground and water speed 248
VHW Water speed and heading 249
VTG Course over ground & ground speed 249
VWR Relative (apparent) wind speed and angle 249
ZDA Time and date 250
Specification of proprietary Simrad telegrams 250
DBS Depth of trawl below surface 250
FS3300 Binary depth 251
GLL Trawl position 251
HFB Trawl headrope to footrope and bottom 251
MDS Measured data shoal 252
MTW Water temperature at the trawl 253
PSIMP-F PI Sensor definition 253
PSIMP-D PI Sensor data 254
TDS Trawl door spread 255
TFI Trawl filling 255
TPC Trawl position in cartesian coordinates 256
TPP Tracked target position or marker 256
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ABOUT THIS MANUAL

Purpose

The purpose of this manual is to provide the information and basic drawings required for installation of the Simrad SX90.

For more detailed information about the practical use of the product, refer to the *Simrad SX90 Operator manual* or the *Simrad SX90 Reference manual*.

About the technical descriptions and the target audience

This manual describes the installation of the Simrad SX90.

The manual is intended for technical personnel; qualified maintenance engineers and technicians. It is assumed that the personnel is conversant with the general principles of maritime electronic equipment, in particular sonar, echo sounder and catch monitoring systems. The personnel must also be familiar with computer hardware, signal processing, interface technology and traditional troubleshooting on electronic and mechanical products.

The instructions must be followed carefully to ensure optimal performance. As a guide, installation procedures are presented in the order they are to be performed. Successful completion of each procedure is to be confirmed by checking off the corresponding box.

Note

The installation instructions given in this document must be adhered to. Failure to do so may render the guarantee void.

Kongsberg Maritime AS will accept no responsibility for any damage or injury to the system, vessel or personnel caused by equipment that has been incorrectly installed or maintained, or by drawings, instructions or procedures that have not been prepared by us.

The equipment described in this manual includes the complete system with associated cabinets, but not system units provided locally by the customer, installation shipyard or local dealer. The manual also defines the equipment responsibility, and provides instructions for unpacking and storage.

After installation, this document must be stored on board the vessel for later reference when updating or servicing the equipment.

Installation drawings

Detailed vessel specific mechanical drawings for the installation must be provided by the customer, or any shipyard contracted to perform the installation.

Kongsberg Maritime AS may, on special order, provide assistance to these drawings. Drawings must be approved by the appropriate vessel certification authority prior to installation of the system.

Applicable outline dimension and productions drawings are provided in the *Drawing file* chapter. Drawings may also be downloaded in PDF and/or DWG formats from http://www.simrad.com.

References

The following user manuals have been provided for the Simrad SX90. English manuals are provided with the SX90 when it is shipped. When available, manuals in other languages may be downloaded from http://www.simrad.com.

- Simrad SX90 Installation Manual, English **[307531]**
- Simrad SX90 Operator Manual, English **[307672]**
- Simrad SX90 Reference Manual, English **[307670]**

SIMRAD SX90

Study this chapter to familiarize yourself with the Simrad SX90.

Topics

- *Basic information* on page 13
- *Main units* on page 14
- *System diagram* on page 17
- *Installation procedure* on page 18
- *Scope of supply* on page 20
- *Additional required items* on page 20
- *Additional optional items* on page 22
- *General supply conditions* on page 27
- *General installation requirements* on page 28
- *Support information* on page 30

Related topics

- *General safety rules* on page 200
- *Equipment handling* on page 201
- *Basic cable requirements* on page 234

Basic information

The Simrad SX90 is a long range omnidirectional low frequency sonar.

It is designed for medium and large sized fishing vessels, preferably for purse seiners, but it is also well suitable for trawlers.

The sonar allows you to choose an operational frequency between 20 to 30 kHz (in 1 kHz steps). The cylindrical multi-element transducer allows the omnidirectional sonar beam to be tilted electronically from +10 to –60 degrees. This allows you to automatically track schools of fish, and to observe the whole water volume around the vessel. A stabilising system is included for electronic pitch and roll compensation.

Great emphasis has been placed on giving the best possible presentations on a high resolution colour display.

The SX90 Processor Unit is controlled by Microsoft's Windows XP® operating system, which result in a flexible choice of display modes for a large range of user applications.

The signal processing and beamforming is performed in a fast digital signal processing system using the full dynamic range of the signals.

In addition to the traditional single frequency transceiver system, the Simrad SX90 contains an advanced frequency modulated filter system (FM).

Main units

The Simrad SX90 comprises the following units:

Normally installed in the wheelhouse:

- *Display Unit*
- *Operating Panel*
- *Processor Unit*
- *Operating Panel power supply*
- *Audio amplifier with loudspeakers (option)*

Normally installed in the sonar room:

- *Transceiver Unit*
- *Hull Unit*

Wheelhouse units

Display Unit

The colour display is a high-resolution monitor. In addition to the sonar picture, the monitor will also display the menu system for the interactive operation. In order to ease the situation comprehension, certain colours have been chosen to better the distinction between the various elements in the presentation.

The colour display is not a part of the sonar delivery, and it must be purchased locally.

Operating Panel

Figure 1 Operating Panel

The Operating Panel contains all necessary control functions for normal operation of the sonar.

The controls are arranged in logical function groups, this gives a clear and easy operation.

Note that all sonar operation can also be made using the trackball on the Operating Panel and the menu system. You can also use a standard computer mouse.

Processor Unit

The **Processor Unit** is a marine computer based on the Microsoft Windows XP® operating system. It is designed for rugged use.

The computer is based on a commercial design, but the software and hardware has been specified and assembled by Simrad to suit the SX90 requirements.

The computer holds a DVD player for use with future software upgrades.

Figure 2 Processor Unit

The purpose of this computer is to allow you to control the sonar. The computer serves several functions.

- It controls the overall operation of the sonar functions.
- It provides the graphic presentation of the sonar modes and echoes.
- It holds the menu system.
- It communicates with the Operating Panel to read the buttons and trackball movements.
- It performs the advanced signal processing and beamforming required to present the information on the display.
- It communicates with peripheral devices and sensors using serial lines.
- It communicates with the Transceiver Unit.

Operating Panel power supply

A small power supply is implemented to provide stand-by power to the Operating Panel. The power supply is connected to the Processor Unit.

Audio amplifier with loudspeakers

An amplifier with one or two loudspeakers may be connected to the Processor Unit to provide the audio output.

These optional items are not provided with the standard sonar delivery.

If standard commercial PC loudspeakers are used, these are normally powered by a separate power supply.

Sonar room units

Transceiver Unit

The SX90 Transceiver Unit is located in the sonar room, close to the Hull Unit.

The transceiver performs the transmission and reception control of the 256 transmitters and 256 receiver channels. Eight identical transceiver boards are used. The Transceiver Unit also holds two power supplies, an Ethernet switch, and a large capacitor bank. One Ethernet cable is used for communication with the wheelhouse, and a second Ethernet cable is used to control the hull unit.

The transducer cables from the hull unit are plugged into the side wall of the Transceiver Unit cabinet using a special plug.

The Transceiver Unit is mounted on the bulkhead using powerful shock absorbers. The connectors for power and interface are located at the bottom of the cabinet.

Hull Unit

The standard **SX92 Hull Unit** is designed to lower the transducer 1.2 meters below the ship's hull, while an optional hull unit will lower the transducer to 1,6 meters below the hull.

The transducer can also be lowered to any selected middle position. In case of voltage failure, the transducer can be raised or lowered manually by means of a hand crank.

The sensor for the electronic stabilisation of the sonar beams is housed in the Motor Control Unit, which is mounted on the Hull Unit.

WARNING

If the transducer hits larger objects or bottom, the transducer shaft may be bent, or - in worst case - it can be broken off. A broken transducer shaft will cause water leakage through the top of the shaft.

In such cases, do not raise the transducer shaft to its upper position.

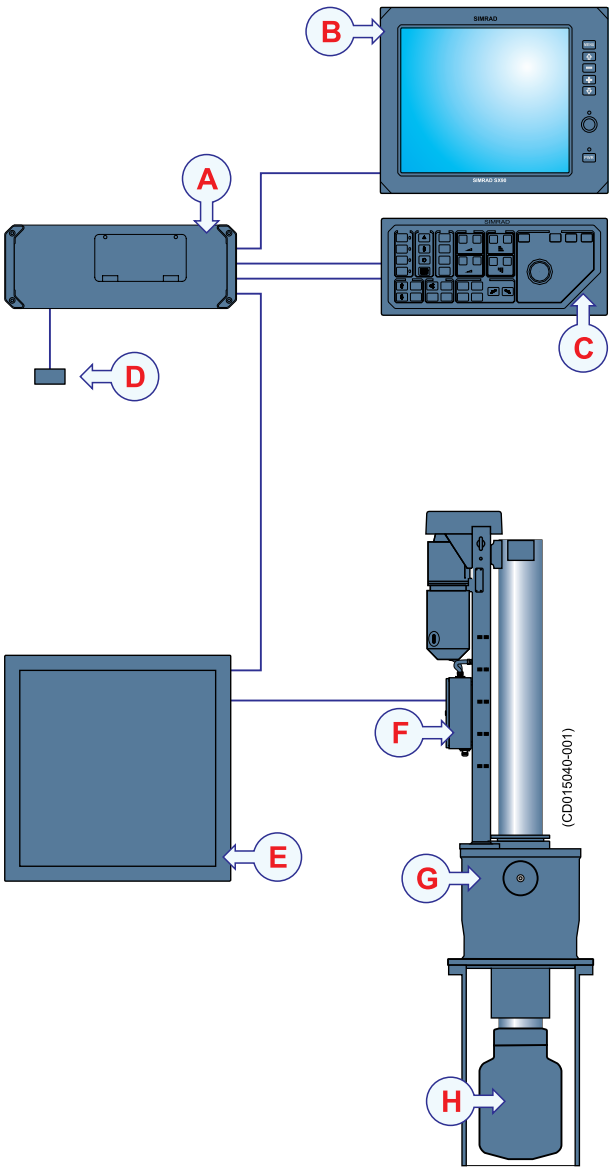
To prevent serious damage, you must have a water pump and a warning system in the sonar room.

Transducer

The cylindrical **Transducer** allows the sonar beam to give full 360 degrees coverage of the water volume from +10 and down to -60 degrees.

System diagram

Figure 3 SX90 Simplified system diagram



A *Processor Unit*
B *Display Unit*
C *Operating Panel*
D *Operating Panel power supply*
E *Transceiver Unit*
F *Motor Control Unit*
G *Hull Unit*
H *Transducer*

Installation procedure

The Simrad SX90 is a complex and advanced product for professional use.

Note

In order to obtain maximum safety and performance, it is very important that the installation procedures in this manual are complied to, and that the tasks are carried out in the succession they are described. The vessel owner must make sure that the installation shipyard holds the applicable competence to perform the installation, and that the applicable maritime authorities are available to verify and certify the installation.

Observe the basic requirements in General safety rules on page 200!

An overall installation procedure is provided below. The procedure does not describe any detailed tasks, but refers to the relevant procedures in this manual.

1 Based on the vessel drawings and best practice, determine where the hull unit shall be located. Necessary considerations must be taken to avoid acoustic and electric disturbances. Make sure that the sonar room meets the specifications provided. Refer to *Installation planning* on page 31.

2 Perform the physical installation of the sonar trunk. The installation shipyard must provide all necessary installation drawings in order to carry out this operation, and if required, these drawings must be approved by the applicable maritime authorities. The trunk penetrates the hull, and it is therefore a crucial part of the hull unit assembly. Refer to *Sonar trunk installation* on page 39.

3 Install the hull unit. Due to its physical size and weight, and the fact that the trunk penetrates the vessel hull, it is very important that the hull unit is installed and secured properly. Refer to *Hull unit installation* on page 45.

4 Install the Transceiver Unit. Refer to *Transceiver unit installation* on page 57.

5 Install the wheelhouse units. Refer to *Wheelhouse units installation* on page 61.

6 Perform the system cabling. Observe the procedure and cable plan in section *Cable layout and interconnections* on page 71. For additional information, refer to *SX90 cable details* on page 212. General requirements for the cabling are provided in *Basic cable requirements* on page 234.

7 Perform the start-up procedures as detailed in section *Start-up procedures* on page 99.

Note

In order to set up the sonar system in a safe and correct manner, these start-up procedures must be complied to!

8 Connect the peripheral units. Observe the setup and test procedures in section *Interfacing peripheral equipment* on page 134. For additional information, refer to *SX90 cable details* on page 212. General requirements for the cabling are provided in *Basic cable requirements* on page 234.

9 Check the source level and receiving voltage response, and make the noise/speed measurements. Observe the procedures in section *Final tests and measurements* on page 155.

10 Create a backup of all the software and installation setup parameters on the Processor Unit. See *Processor Unit backup and restore* on page 167.

11 Fill in and sign the *Installation Remarks* form, and send it to Simrad's support department as specified on the form. See *Installation remarks* on page 263.

Scope of supply

Main units included with the standard delivery

- Operating Panel [**SH8-203593**]
- Processor Unit [**340326**]
- Transceiver Unit [**307668**]
- Hull Unit [**307476**]

Additional required items

The following additional items are required for a fully operational sonar, but they are not included in the standard delivery:

- Colour display
- Uninterrupted Power Supply (UPS)
- Installation trunk
- Speed log
- Course gyro

Display Unit

The Simrad SX90 requires a VGA or DVI colour display with a resolution of at least 1280 x 1024 pixels.

Uninterrupted Power Supply (UPS)

In order to ensure continuous operation of the Simrad SX90 independent of varying quality of the vessel's mains supply, the use of uninterrupted power supplies (UPS) is required. Two UPS units are used:

- One is used to power the wheelhouse units.
- One is used to power the Transceiver Unit.

The uninterrupted power supply (UPS) units are not included in the standard delivery. Several commercial types are available. To choose the best UPS for the sonar installation, consider environmental conditions, space available, the availability and duration of the batteries, and the power requirements of the sonar units.

Minimum UPS power specifications

- **Input voltage**: Must fit vessel supply voltage
- **Output voltage**: 230 Vac, 50 Hz
- **Output power**:
  - Wheelhouse units: 600 W
  - Sonar room units: 1500 W
- **Output requirement**: The AC output voltage must be a sine wave

Installation trunk

The installation trunk required for the hull unit installation is not included in the standard delivery.

The installation trunk may be fabricated by the shipyard, or supplied by Simrad as an option. The mechanical drawings of the trunk and blind cover are included in this manual. The Simrad SX90 sonar is delivered without a dome system.

The optional trunk offered by Simrad is approved by Det Norske Veritas (DNV), and includes a blind cover and a gasket.

Speed log

In order to operate correctly, the Simrad SX90 requires input from a speed log. In most cases a suitable sensor is already installed on the vessel. A differential global positioning system ((D)GPS) can also be used.

Speed log interface parameters:

- **Serial line**: Standard NMEA 0183 telegram format

For more information, see *Connecting the speed log* on page 146.

Course gyro

In order to operate correctly, the Simrad SX90 requires input from a course gyro. In most cases a suitable sensor is already installed on the vessel.

Course gyro interface parameters:

- **Serial line**: Standard NMEA 0183 telegram format

For more information, see *Connecting the course gyro* on page 147.

Gyro interface

If the course gyro installed does not output the correct serial interface format, an optional gyro interface box is available. It will convert the following synchro and stepping gyro signals:

- 3-phase synchro signal, 20 to 150 V L-L, 50/60/400 Hz, gear ration 1:360 or 1:180
- 3-phase stepper signal, 20 to 150 V L-L, gear ration 1:360 or 1:180

Ordering information	
LR40 Gyro interface	298-078535

Additional optional items

The following optional equipment and functionality may be ordered at an additional charge to augment the standard Simrad SX90 system delivery, or purchased locally by the installation shipyard or end user.

- Hull units and installation trunks
- Extended range
- Scientific interface
- Other peripheral equipment
- Audio output

Hull units and installation trunks

Hull units

The standard **SX92 Hull Unit** can be lowered 1.2 meters at a speed of 24 knots. The mounting flange has 24 bolts with pitch centre diameter (PCD) 680 mm. Other hull units are available as listed below.

Table 1 Hull units available from Simrad

Hull Unit	**Specifications**	**Order no.**
SX90	1.2 m, 24 knots, 20 bolts, PCD 620 mm	307472
SX91	1.6 m, 20 knots, 20 bolts, PCD 620 mm	307474
SX92*	1.2 m, 24 knots, 24 bolts, PCD 680 mm	307476
SX93	1.6 m, 20 knots, 24 bolts, PCD 680 mm	307478
SX95	1,0 m, 12 knots, 16 bolts, PCD 540 mm	310279
(* = SX92 is the standard hull unit)		

Note

The Simrad SX90 and Simrad SX91 hull units and trunks are discontinued. They are only delivered on special order.

Installation trunks

The installation trunk may be fabricated by the installation shipyard, or supplied by Simrad. Several types are available with various pitch centre diameters (PCD).

Table 2 Optional installation trunks available from Simrad

Trunk type	Specifications	Order no.
SX90/SX91	20 bolts, PCD 620 mm	SP9-205825
SX92/SX93	24 bolts, PCD 680 mm	SP9-207516
SX95	16 bolts, PCD 540 mm	SQ4–042508

Note

The Simrad SX90 and Simrad SX91 hull units and trunks are discontinued. They are only delivered on special order.

If you prefer to manufacture your own installation trunk to fit the vessel, observe the drawings in the *Drawing file* on page 182. The same drawings can also be downloaded from www.simrad.com.

Extended range

Due to international regulations, sonars with operational range exceeding 5000 meters can only be exported on license. For this reason the standard range on the SX90 has been limited to 4500 meters. However, if an export licence is obtained, the maximum range can be extended to 8000 meters.

Ordering information	
Extended 8000 m range	314506

Scientific interface

A special software key can be purchased to enable an Ethernet interface providing sonar beam data, sonar settings and processed target data. This feature is very useful if the sonar is intended for scientific purposes.

Ordering information	
Scientific interface	KIT-203477

Other peripheral equipment

The Simrad SX90 provides a total of four serial lines. Two of these are used to interface to the speed log and course gyro. The remaining serial lines can be used to communicate with other peripheral equipment.

- Differential Global Positioning System ((D)GPS)
- Echo sounder
- Catch monitoring system
- Trawl sonar
- Current meter system
- Radio buoy system

All these peripherals may be connected using the serial lines. Most of them will communicate by means of the standard NMEA 0183 format.

Note

Equipment and sensors must be purchased locally by the installation shipyard or end user.

Differential Global Positioning System ((D)GPS)

A (D)GPS may be interfaced with the Simrad SX90 sonar to establish the vessel's position and provide cursor and marker latitude and longitude. In addition to navigational data, the (D)GPS may also be used for the input of speed log information. Most (D)GPS are equipped to present course information, but this data is generally too inconsistent to provide a stable sonar presentation.

For cabling information, see *Positioning system interface* on page 213.

Echo sounder

An external echo sounder may be connected to the sonar to provide depth information on the catch control page of the sonar's display.

For cabling information, see *Echo sounder system interface* on page 214.

Catch monitoring system

To provide trawl and purse seine depth information on the sonar's display, the following Simrad catch monitoring systems may be connected:

- Simrad PI Series Catch monitoring systems
- Simrad ITI Integrated Trawl Instrumentation system

For cabling information, see *Catch monitoring system interface* on page 215.

Trawl sonar

To provide trawl information on the sonar's display, one of the following Simrad trawl systems may be connected:

- Simrad FS903 Trawl sonar
- Simrad FS3300 Trawl sonar
- Simrad FS20/25 Trawl sonar
- Simrad FS70 Trawl sonar

For cabling information, see *Trawl sonar interface* on page 214.

Current meter system

A current meter system may be connected to the sonar to display the direction and speed of the sea currents on various depths. The following current system can be connected:

- Kaijo DCG-200

For cabling information, see *Current meter interface* on page 215.

Radio buoy system

A GPS based radio buoy system may be connected to the sonar to show the position and buoy data on the display. The following buoy systems can be connected:

- SERPE
- Ariane
- Ryokusei

For cabling information, see *Radio buoys connection interface* on page 215.

Audio output

The Simrad SX90 provides an audio output.

In order to use this function, you must connect an amplifier with speakers to the audio output on the Processor Unit.

Loudspeakers and amplifier must be purchased locally by the installation shipyard or end user.

About the audio output

The audio output on the SX90 Processor Unit is a line output, and no power amplifier is provided to create sound.

The audio output must therefore be connected to a powered audio system. The system must include a volume control, as the audio output level from the sonar is fixed. The audio output level can not be controlled by the **Audio off** button on the Operating Panel, as this button will silence the audio output completely.

Note

Do not connect a loudspeaker directly to the audio output. This may damage the audio output circuitry.

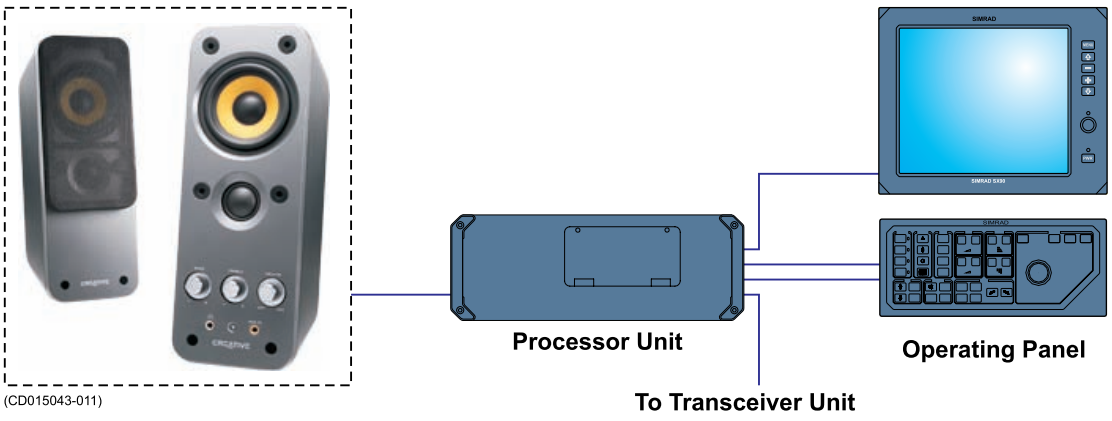
We recommend that one of the following audio systems is used:

- Commercial powered speaker system for PC use
- Commercial stereo system with amplifier and two (or more) loudspeakers

Powered speaker system for PC use

A commercial powered speaker system for PC use can be obtained from almost any kind of shop for electric appliances, home stereo or computers.

Figure 4 Sonar audio using powered speaker system for PC

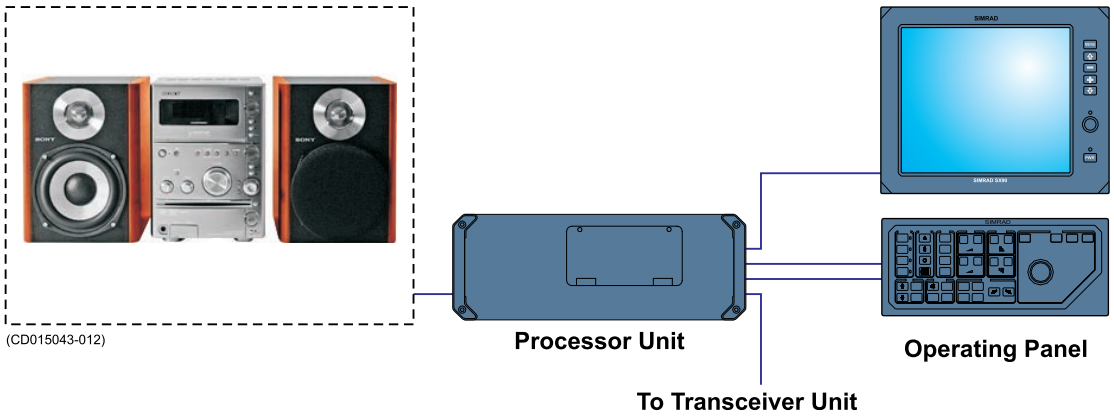


The number of speakers, size and power output can be selected to suit the crew preferences. The location of the speakers must be decided to allow for easy adjustment of the audio level.

Stereo system with amplifier and two or more loudspeakers

If a stereo system is already installed on the bridge, the audio output from the sonar can be connected to an auxiliary input.

Figure 5 Sonar audio using existing stereo system



The advantage of this setup is that most stereo systems are provided with a remote control, and this allows for easy adjustment of the audio level.

General supply conditions

The following supply conditions are applicable to this Simrad SX90 delivery.

Equipment responsibility

The shipyard performing the installation and/or equipment dealer becomes fully responsible for the equipment upon receipt unless otherwise stated in the contract. The duration of responsibility includes:

- The period of time the equipment is stored locally before installation.
- During the entire installation process.
- While commissioning the equipment.
- The period of time between commissioning and the final acceptance of the equipment by the end user (normally the owner of the vessel which the equipment has been installed).

Unless other arrangements have been made in the contract, the Simrad SX90 guarantee period (as specified in the contract) begins when the acceptance documents have been signed

Receipt, unpacking and storage

Upon accepting shipment of the equipment, the shipyard and/or the dealer should ensure that the delivery is complete and inspect each shipping container for evidence of physical damage. If this inspection reveals any indication of crushing, dropping, immersion in water or any other form of damage, the recipient should request that a representative from the company used to transport the equipment be present during unpacking.

All equipment should be inspected for physical damage, i.e. broken controls and indicators, dents, scratches etc. during unpacking. If any damage to the equipment is discovered, the recipient should notify both the transportation company and Simrad so that Simrad can arrange for replacement or repair of the damaged equipment.

Once unpacked, the equipment must be stored in a controlled environment with an atmosphere free of corrosive agents, excessive humidity or temperature extremes. The equipment must be covered to protect it from dust and other forms of contamination when stored.

For more information, see the appendix related to equipment handling.

→ *Equipment handling* on page 201

General installation requirements

The following installation requirements are applicable to this Simrad delivery.

Approval by classification society

The Simrad SX90 transducer installation must be approved by Det Norske Veritas (DNV) or another classification society. The shipowner and shipyard performing the installation are responsible for obtaining installation approval.

Supply power

The supply voltage to the equipment is to be kept within ±10% of the installation's nominal voltage. Maximum transient voltage variations on the main switchboard's bus-bars are not to exceed -15% to +20% of the nominal voltage (except under fault conditions).

Simrad recommends that the Simrad SX90 is powered using an Uninterruptable Power Supply (UPS) with sine wave output. The UPS must have the capacity to independently maintain power to the system for a minimum of 10 minutes. This ensures that the system can be switched off in a controlled manner in the event of a power failure.

Compass deviation

Once the installation is complete, the vessel must be swung with the system in both the operative and inoperative modes. The shipowner and captain are responsible for updating the deviation table accordingly with regard to the vessel's national registry and corresponding maritime authority.

Noise sources

The vessel's hull, rudder(s) and propeller(s) should be thoroughly inspected in dry dock prior to installation. Roughness below the water-line deformities in the shell plating and protruding obstacles can create underwater noise. These sources of turbulence must be smoothed or removed as best as possible. It is especially important that the propeller(s) is not pitted or damaged.

Dry docking

Make sure that ample clearance under the sonar trunk and/or protection blister is provided when dry docking the vessel. Avoid locating supporting blocks or structures in the vicinity of this equipment.

Note

The location of the transducer and/or protection blister must be noted on the vessel's docking plan for future reference.

Power down all hydroacoustic systems, and label each system accordingly to prevent accidental power on. Remove circuit breakers if necessary.

Wiring

All cables running between system cabinets located in different rooms and/or on different decks must be supported and protected along their entire lengths using conduits and/or cable trays. Note that the cables must not be installed in the vicinity of high-power supplies and cables, antenna cables or other possible sources of interference.

Note

Whenever possible, transducer cables must be run in steel conduits.

For more detailed information about cables and wiring, refer to the basic cable requirements.

→ *Basic cable requirements* on page 234

Support information

If you need additional technical support for your Simrad SX90 you must contact your local dealer, or one of our support departments.

Norway (Main office)

- **Address**: Strandpromenaden 50, 3190 Horten, Norway
- **Telephone**: +47 33 03 40 00
- **Telefax**: +47 33 04 29 87
- **E-mail address**: simrad.support@simrad.com
- **Website**: http://www.simrad.no

Spain

- **Address**: Poligono Partida Torres 38, 03570 Villajoyosa, Spain
- **Telephone**: +34 966 810 149
- **Telefax**: +34 966 852 304
- **E-mail address**: simrad.spain@simrad.com
- **Website**: http://www.simrad.es

USA

- **Address**: 19210 33rd Ave W, Lynnwood, WA 98036, USA
- **Telephone**: +1 425 712 1136
- **Telefax**: +1 425 712 1193
- **E-mail address**: simrad.usa@simrad.com
- **Website**: http://www.simrad.com

INSTALLATION PLANNING

Note

For installation in a previously installed trunk system, first read the information about sonar room requirements. Then proceed to the Hull Unit installation description.

This chapter provides the marine engineers responsible for the installation the information necessary to plan the installation the Simrad SX90 according to Simrad's requirements.

Correct installation of the SX90 transducer is vital to the system's performance.

Several variables must be taken into consideration, the most important of which is the vessel's construction. This guide can be used to select the best location for the transducer, and includes a brief description of areas to be avoided.

Installation drawings must be supplied by the shipyard.

Note

The installation must be approved by the vessel's national registry and corresponding maritime authority and/or classification society. The shipowner and shipyard performing the installation are responsible for obtaining and paying for installation approval.

Topics

- *About installation drawings* on page 31
- *Location of the hull unit* on page 32
- *Sonar room requirements* on page 34
- *Sonar room arrangement example* on page 36

About installation drawings

All installation drawings must be supplied by the shipyard performing the installation.

Note

The installation must be approved by the vessel's national registry and corresponding maritime authority and/or classification society. The shipowner and shipyard performing the installation are responsible for obtaining and paying for installation approval.

Simrad offers free advice for installation planning. Proposed arrangements may be sent for commentary or suggestions supplied by Simrad. The following drawings should be submitted should assistance be requested:

- General arrangement
- Body plan and drawings of relevant bottom tanks and cofferdams
- Lines plan

Location of the hull unit

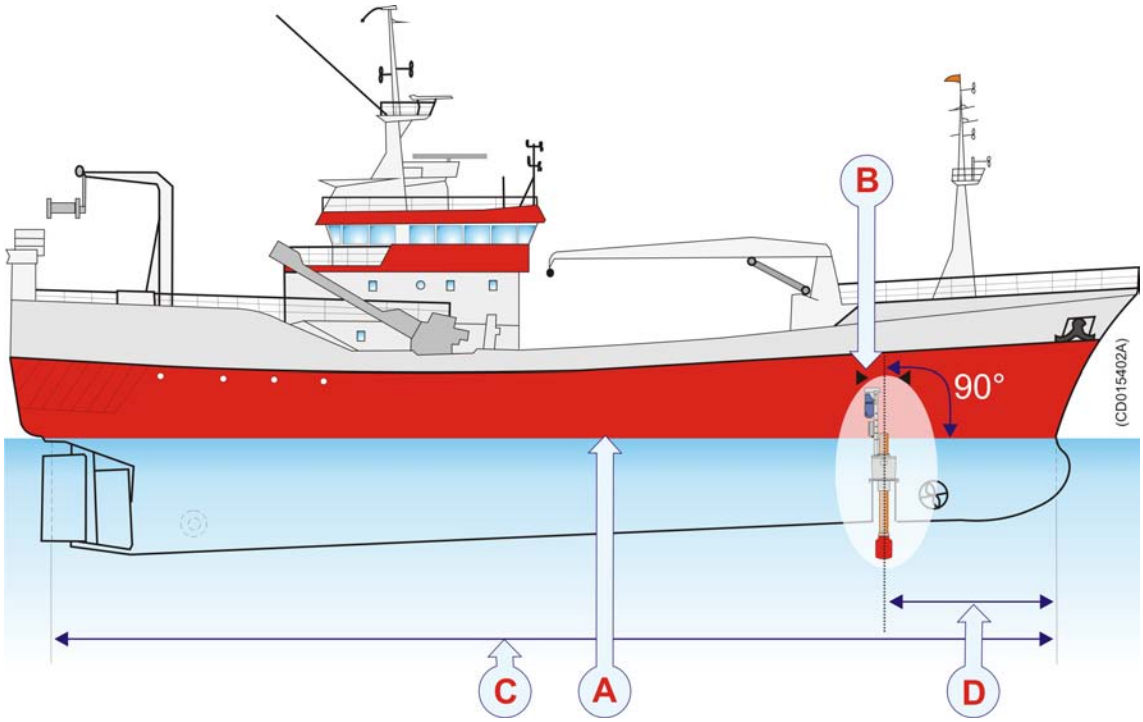
Fore and aft

The hull unit should preferably be located within 1/3 to 1/10 of the vessel's *Length Between Perpendiculars* (LBP) from its *Forward Perpendicular* (FP). Deviations should not be made without consulting Simrad.

Athwartships

The hull unit may be located on the *Centre Line* (CL) of the vessel, or alongside its keel. If the installation is offset from the vessel's centre line, make sure that transducer transmission and reception will not be obstructed by the keel.

Figure 6 Location of the hull unit



A *Water level at normal trim*

B *Welding marks to indicate hull unit location when docking*

C *Length Between Perpendiculars (LBP)*

D *1/3 to 1/10 of LBP*

Important considerations related to noise

The installation trunk must be installed so that it will remain vertical under normal operating conditions. The primary sources of underwater disturbance (other than a vessel's main propeller and bow/stern thruster) that affect transducer reception are:

- Main or bilge keels
- Zinc anodes
- Cooling elements protruding from the hull
- Equipment such as sonar transducers and pilot tubes
- Sea chests
- Overboard discharges
- Dents in the hull

All appendages to the hull, indentations and pipe in/outlets are potential sources of underwater noise. They may act as resonant cavities amplifying noise at certain frequencies, create cavitation or turbulence. Transducers should not be located in the vicinity of such objects and especially not immediately aft of them.

Sonar room requirements

Observe these minimum sonar room requirements to obtain suitable working conditions for sonar installation, use and maintenance.

It is strongly recommended to use a dedicated compartment to house the hull unit and the transceiver cabinet. These two units must also be installed relatively close to each other due to the limited length of the transducer cables.

Size and access

A well designed sonar room reduces the risk of corrosion and simplifies maintenance increasing system reliability.

- The sonar room must be dimensioned to house all the relevant cabinets that comprise the Simrad SX90.
- The physical distance between the Transceiver Unit and the hull unit is limited due to the length of the transducer cables.
- The sonar room must not be unnecessarily obstructed by girders, pipes etc. which might cause installation problems or impede maintenance.
- The sonar room must be accessible under all conditions at sea or at a berth.
- All doors or hatches must be designed so that the equipment can be removed without being disassembled.

Heating

The sonar room must be equipped with heater, dimensioned to maintain the equipment within its environmental tolerances (at least 1000 W), installed close to the deck. Heating is also an effective method for reducing humidity.

Insulation

Bulkheads must be insulated and provided with an interior wall to the deck. The insulation should be the minimum equivalent of 50 mm of rock-wool. In addition, piping passing through the space prone to condensation must be insulated.

Ventilation

The sonar room must be connected to the vessel's ventilation system. If this is not possible, two 3" vents must be provided from the sonar room to the main deck. In the room, the air inlet must whenever possible be located close to the deck and the outlet as high as possible. A funnel shaped drip-collector must be mounted below the vent pipes to divert moisture to the bilge. On the main deck, the best ventilation is provided when the outlet

pipe is at least four meters higher than the inlet pipe. To keep out sea water, rain and spray, the ventilation pipes should be fitted with goosenecks or the equivalent. If the vessel is likely to operate in tropical conditions, a suitable air conditioning system must be installed. This system must be able to provide an ambient temperature not exceeding the maximum operating temperatures for the cabinets installed in the room.

Cable protection

If the cables between the sonar room equipment and other system units located in different compartments on the vessel pass through hatches or areas where they may be damaged, they must be run through conduits (minimum 2” conduit is recommended).

Electrical installations and lights

The sonar room must be equipped with suitable lighting to simplify the installation and to aid future maintenance. A minimum number of electrical outlets must be provided for the system units and other equipment.

Bilge pump and decking

The sonar room must be connected to the vessel’s bilge pump system. If this is not possible, a separate bilge pump for the sonar room must be installed. Once the installation has been completed, the sonar room must be suitably decked without restricting access to the equipment.

Lifting device

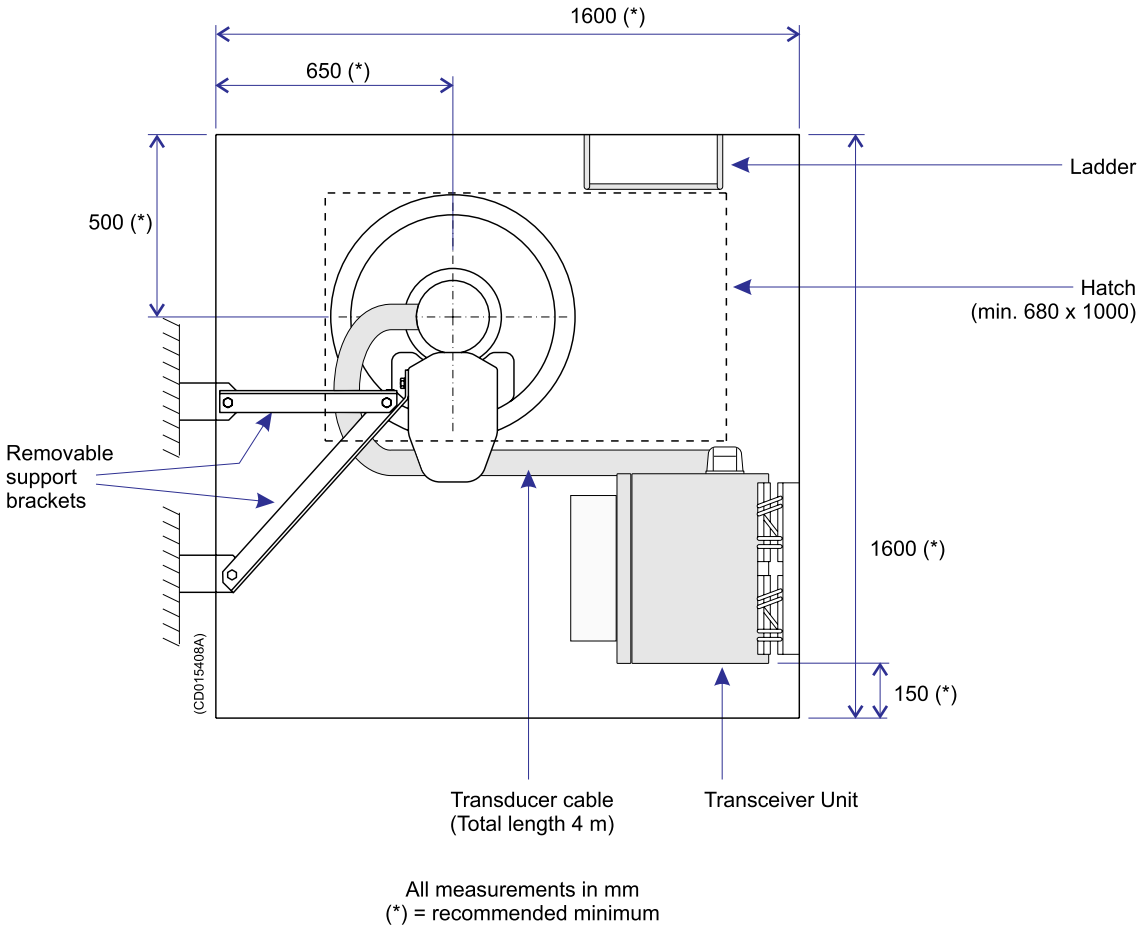
An attachment point, rated at a minimum of two -2- tons, for supporting a lifting device should be located above the hull unit. This permanently installed fixture will facilitate installation trunk and hull unit mounting, and also may be used for future equipment maintenance or replacement.

Sonar room arrangement example

These drawings illustrate a typical sonar room with ample space for the hull unit, the Transceiver Unit and personnel.

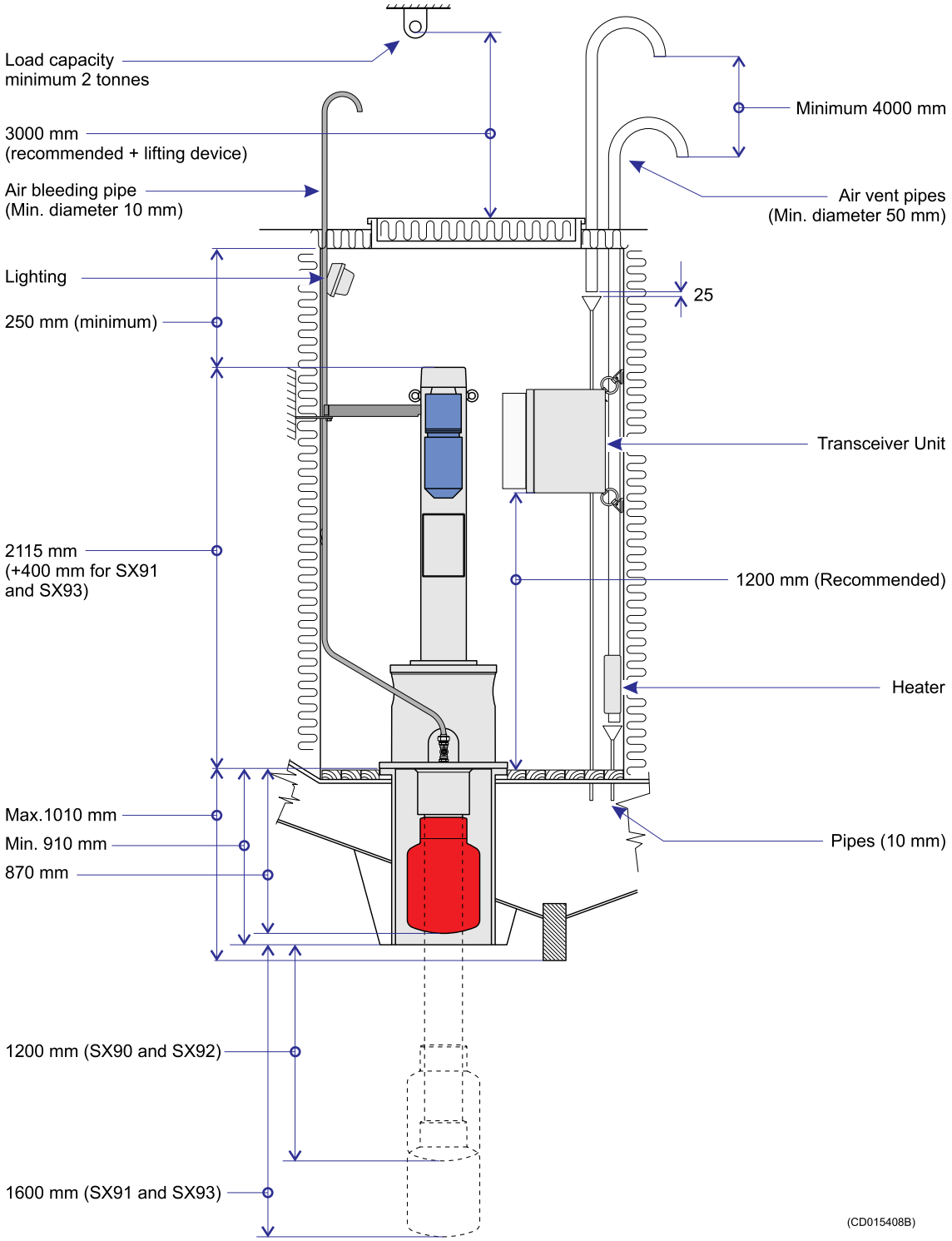
Sonar room arrangement example

Figure 7 Sonar room arrangement example: Top view



Sonar room arrangement example

Figure 8 Sonar room arrangement example: Side view

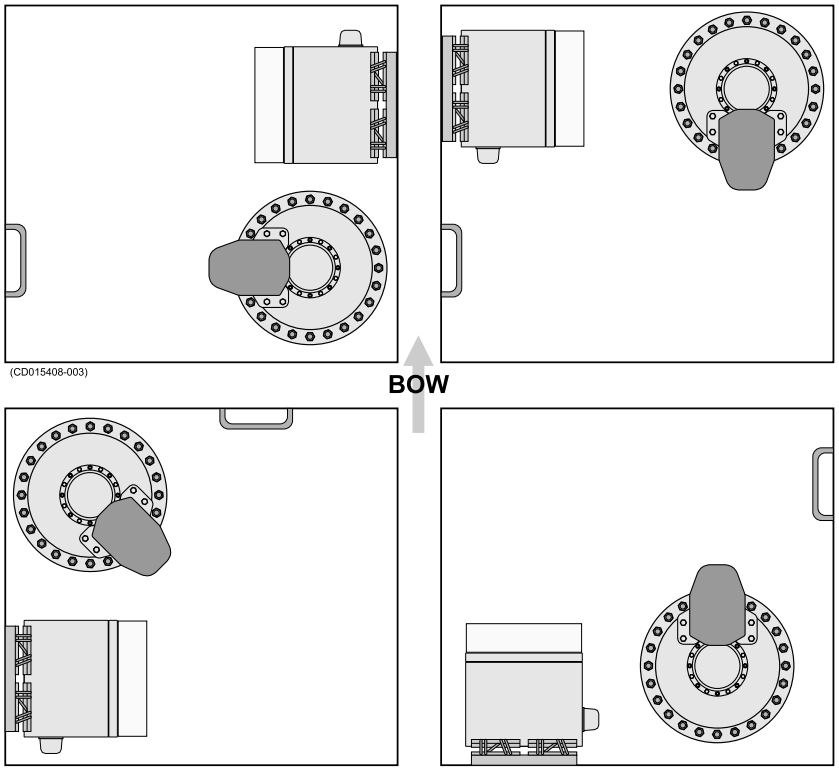


Hull unit orientation example

The hull unit should normally be oriented with the hoisting/lowering motor pointing aft. If this orientation makes the Motor Control Unit attached to the hull unit difficult to access for maintenance purposes, the hull unit may be oriented in the most suitable position.

The distance between the hull unit and the Transceiver Unit is limited by the length of the transducer cable.

Figure 9 Hull unit orientation examples



Irrespective of the hull unit orientation, the transducer shall not be mechanically aligned.

Transducer alignment is performed in the SX90 Processor Unit by rotating the echo presentation on the display. This is described in a dedicated section.

→ *Alignment of the sonar picture* on page 128

SONAR TRUNK INSTALLATION

The sonar trunk provides the physical foundation for the entire hull unit gantry. The trunk further penetrates the hull, and it is therefore a crucial part of the hull unit assembly. In order to ensure proper sonar operation, the location of the sonar trunk must be carefully selected.

A trunk with a blind cover – approved by Det norske Veritas (DnV) – can be ordered from Simrad as an optional delivery, or it may be manufactured by the installation shipyard based on the drawings in this manual and the properties of the hull.

Note

The installation shipyard must provide all necessary installation drawings, and if required, these must be approved by the applicable authorities. See "Installation drawings" in chapter About.

→ *About this manual on page 11*

Topics

- *Mounting the sonar trunk* on page 40
- *Sonar trunk protection* on page 41
- *Sonar trunk installation principles* on page 41
- *Sonar trunk installation measurements* on page 44

Hull unit outline dimension drawings

- *SX90 Hull unit dimensions* on page 188
- *SX91 Hull unit dimensions* on page 189
- *SX92 Hull unit dimensions* on page 190
- *SX93 Hull unit dimensions* on page 191
- *SX90/SX91 Mounting trunk drawing* on page 192
- *SX92/SX93 Mounting trunk drawing* on page 194
- *SX90/SX91 Mounting trunk outline dimensions* on page 196
- *SX92/SX93 Mounting trunk outline dimensions* on page 197
- *SX90/SX91 Blind cover drawing* on page 198
- *SX92/SX93 Blind cover drawing* on page 199

Mounting the sonar trunk

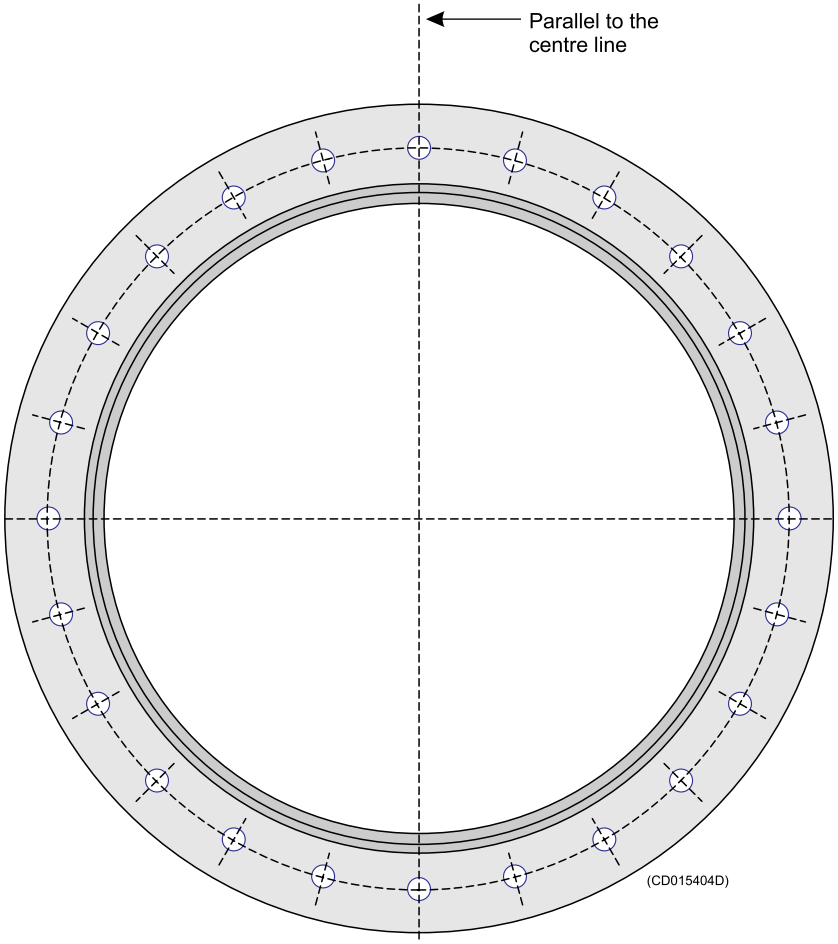
The location of the sonar trunk must be carefully selected.

Note

Note the orientation of the centre line of the trunk with regard to the mounting bolts.

Remove the gasket on the top flange during welding.

Figure 10 Orientation of the sonar trunk



The height from the top of the trunk flange to the underside of the protection blister must be selected as shown in the figures in section *Sonar trunk installation principles* on page 41.

Note

In order to obtain optimal sonar performance, the total height of the trunk must be as close as possible to its stated minimum height.

The top flange must be parallel to the construction water line in both the fore-and-aft and athwartship directions.

The installation trunk must be welded to a doubling plate which must be at least 1.5 times as thick as the surrounding shell plating. The doubling plate's final dimensions are to be governed by the approved installation drawings supplied by the shipyard. The trunk must also be stiffened by welding knee-plates to it and the doubling plate in both the fore-and-aft and athwartship directions.

Sonar trunk protection

Blister protection

Normally, a steel blister is fitted for protection. The blister is welded to the shell plating. The blister may be an open type, or it can be filled with oil to prevent corrosion. This last method provides excellent protection, and simplifies maintenance. See *Sonar trunk installation principles* on page 41.

Corrosion protection

As soon as all installation, welding and grinding has been performed, the trunk and the surrounding area should be primed and painted using a quality protective coating.

Sonar trunk installation principles

Observe the two drawings provided. These illustrate the principal installation of the sonar trunk.

Figure 11 Installation of a trunk with open blister

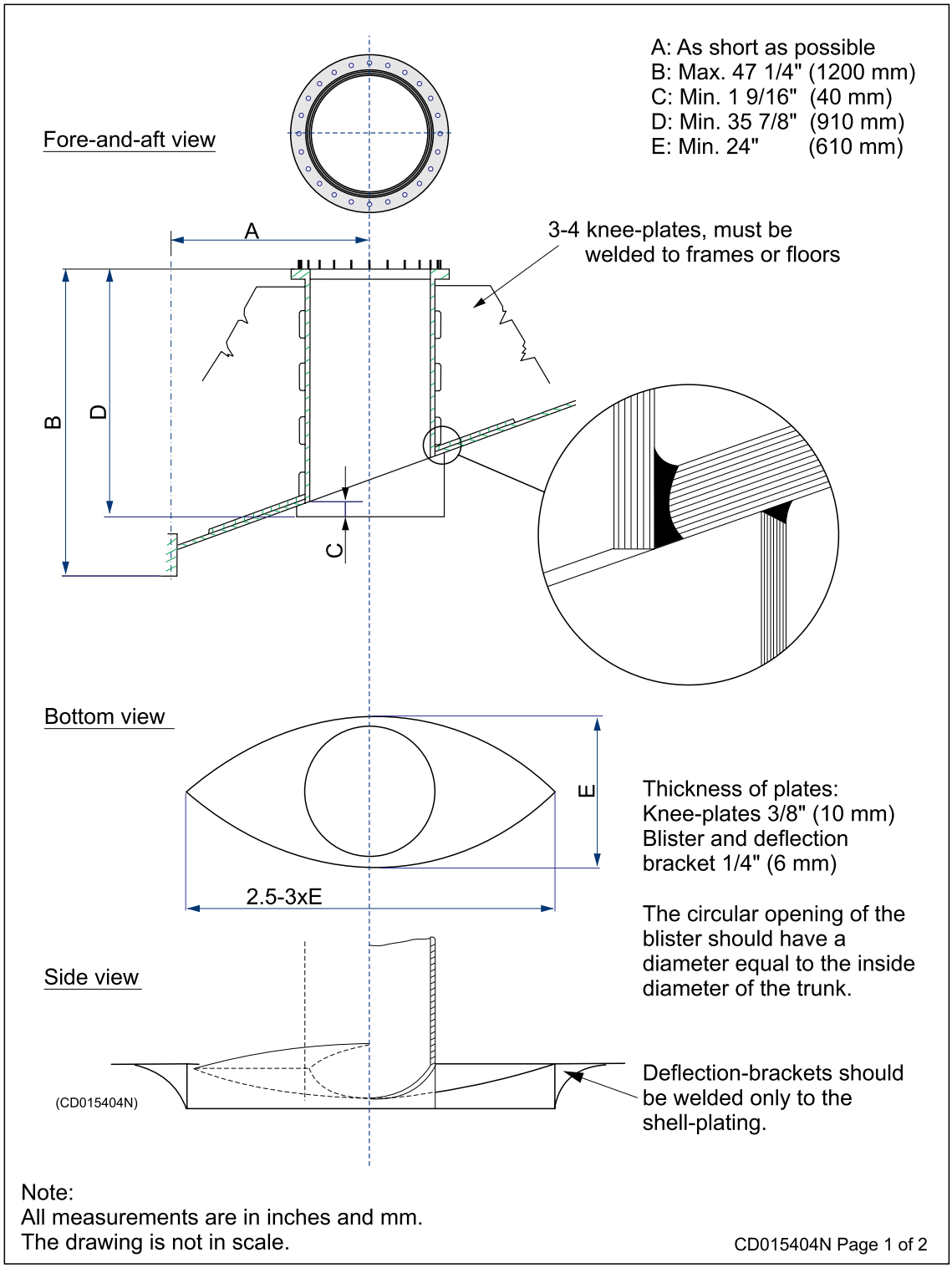
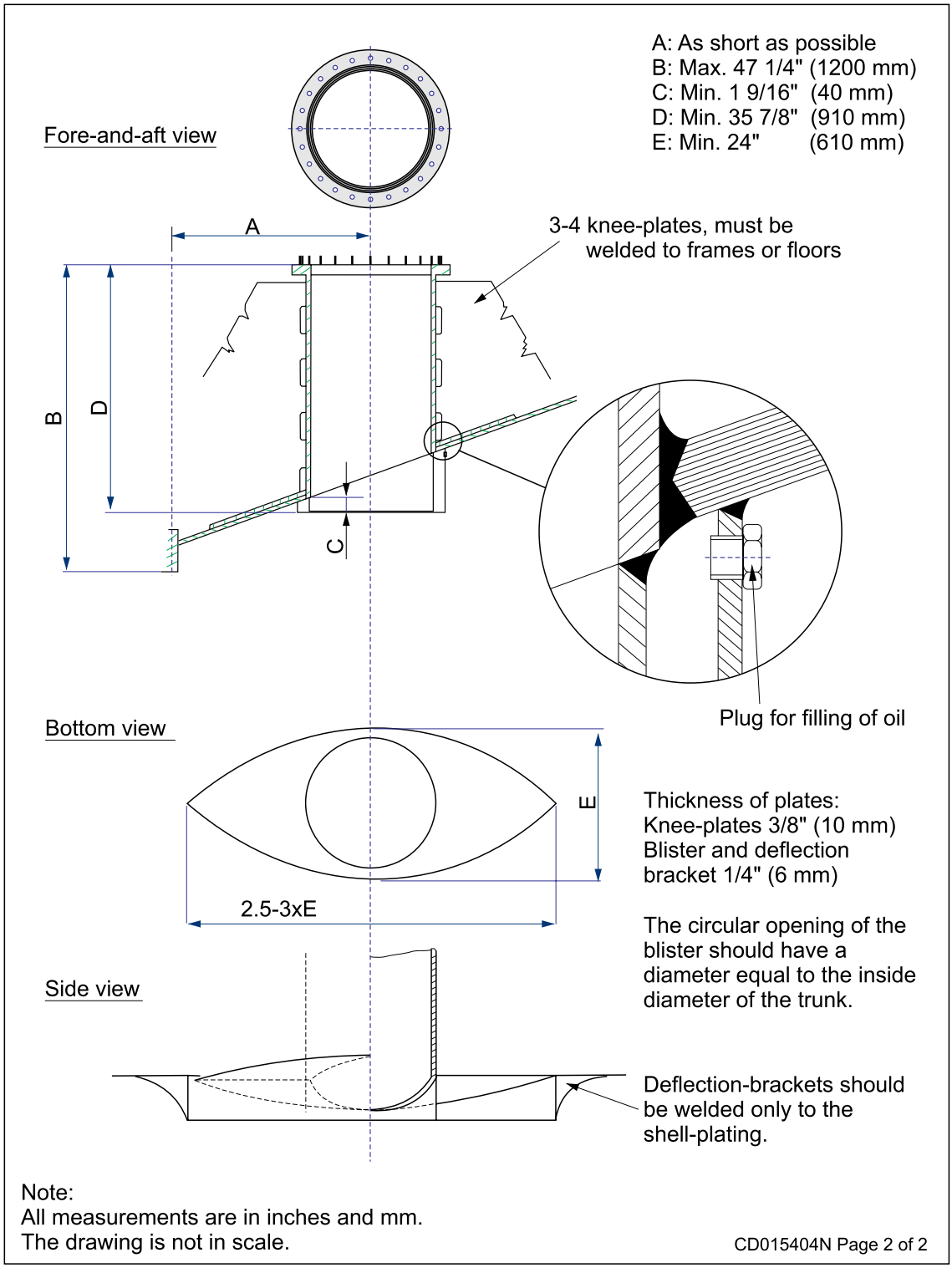

A: As short as possible
B: Max. 47 1/4" (1200 mm)
C: Min. 1 9/16" (40 mm)
D: Min. 35 7/8" (910 mm)
E: Min. 24" (610 mm)
Fore-and-aft view
A
3-4 knee-plates, must be welded to frames or floors
B
D
C
Bottom view
E
2.5-3xE
Thickness of plates:
Knee-plates 3/8" (10 mm)
Blister and deflection bracket 1/4" (6 mm)
The circular opening of the blister should have a diameter equal to the inside diameter of the trunk.
Side view
Deflection-brackets should be welded only to the shell-plating.
(CD015404N)
Note:
All measurements are in inches and mm.
The drawing is not in scale.
CD015404N Page 1 of 2

Figure 12 Installation of a trunk with oil filled blister


A: As short as possible
B: Max. 47 1/4" (1200 mm)
C: Min. 1 9/16" (40 mm)
D: Min. 35 7/8" (910 mm)
E: Min. 24" (610 mm)
Fore-and-aft view
A
B
D
C
3-4 knee-plates, must be welded to frames or floors
Plug for filling of oil
Bottom view
E
2.5-3xE
Thickness of plates:
Knee-plates 3/8" (10 mm)
Blister and deflection bracket 1/4" (6 mm)
The circular opening of the blister should have a diameter equal to the inside diameter of the trunk.
Side view
Deflection-brackets should be welded only to the shell-plating.
Note:
All measurements are in inches and mm.
The drawing is not in scale.
CD015404N Page 2 of 2

Sonar trunk installation measurements

For future reference, the measurements “A”, “B”, “C” and “D” from the drawing must be made and noted in the table below.

Table 3 Trunk installation measurements

	Millimeters	Inches
“A”		
“B”		
“C”		
“D”		

HULL UNIT INSTALLATION

This chapter describes the physical installation of the Simrad SX90 Hull Unit.

Note

This installation manual does not describe the installation of the SX95 Hull Unit. For information about that particular hull unit, refer to the dedicated Simrad SX95 Hull Unit installation manual.

The hull unit is a crucial part of the sonar system. Due to its physical size and weight, and the fact that the trunk penetrates the vessel hull, it is very important that the hull unit is installed and secured properly.

The installation shipyard must provide all necessary installation drawings, and if required, these must be approved by the applicable authorities. See the drawing file for more details.

→ *About this manual* on page 11

→ *Drawing file* on page 182

Note

To ensure the safety of the sonar system and the vessel, it is very important that the mechanical support of the hull unit gantry is satisfactory. For more information, see the information provided about mechanical support.

→ *Mechanical support on page 55*

Topics

- *Hull unit familiarization* on page 47
- *Motor Control Unit familiarization* on page 48
- *Hull unit models overview* on page 48
- *How to unpack the hull unit from its transport box* on page 51
- *Hull unit mounting* on page 53
- *Bleeding air cock* on page 54
- *Mechanical support* on page 55
- *Transducer alignment* on page 55
- *Hull unit installation check list* on page 56

Related topics

- *Hull unit familiarization* on page 100

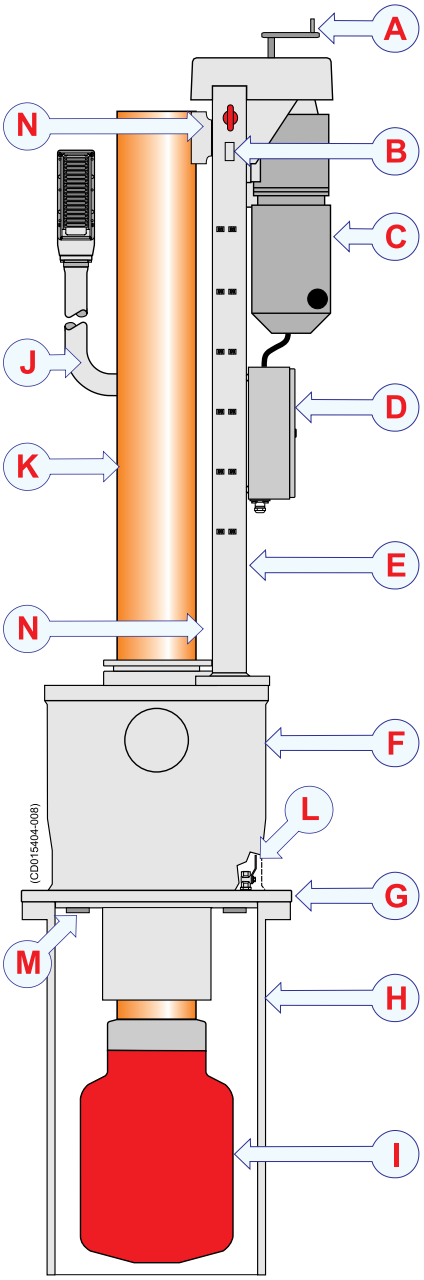
Hull unit outline dimension drawings

- *SX90 Hull unit dimensions* on page 188

- *SX91 Hull unit dimensions* on page 189
- *SX92 Hull unit dimensions* on page 190
- *SX93 Hull unit dimensions* on page 191
- *SX90/SX91 Mounting trunk drawing* on page 192
- *SX92/SX93 Mounting trunk drawing* on page 194
- *SX90/SX91 Mounting trunk outline dimensions* on page 196
- *SX92/SX93 Mounting trunk outline dimensions* on page 197
- *SX90/SX91 Blind cover drawing* on page 198
- *SX92/SX93 Blind cover drawing* on page 199

Hull unit familiarization

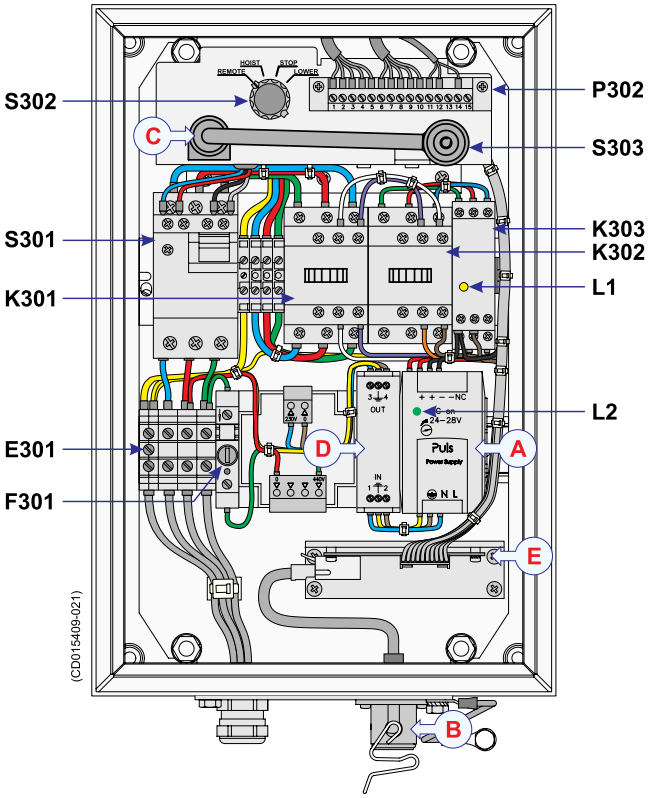
Figure 13 Hull unit familiarization



A *Hand crank for manual hoisting and lowering*
B *Identification label*
C *Hoisting motor*
D *Motor Control Unit*
E *Hoisting unit*
F *Transducer shaft sleeve*
G *Mounting flange*
H *Installation trunk*
I *Transducer*
J *Transducer cable*
K *Transducer shaft*
L *Air bleeding cock*
M *Zinc anodes*
N *Upper and lower limit switches*

Motor Control Unit familiarization

Figure 14 Motor Control Unit familiarization



During normal operational conditions, the following two indicator lamps shall be lit:

- **L1** indicates that the phase watch relay **K303** is activated. This mean that the 3-phase voltage is applied to the hoist/lower system, and that the three phases are correctly connected with regard to the training direction of the hoisting motor.
- **L2** indicates that the internal +24 Vdc power supply for the control electronic is operational.

***A** Internal 24 Vdc power supply*

***B** Ethernet connector*

***C** Hand crank*

***D** Mains filter*

***E** Hull Unit Controller circuit board*

***F301** Fuse for internal power supply*

***E301** Terminal strip for AC mains input*

***K301** Hoisting contactor*

***K302** Lowering contactor*

***K303** Phase watch relay*

***L1** Yellow indicator light*

***L2** Green indicator light*

***S301** Motor protecting switch*

***S302** Hoist/lower switch*

***S303** Hand crank with safety switch*

***P302** Connector for hull unit limit switches and rotation sensor*

Hull unit models overview

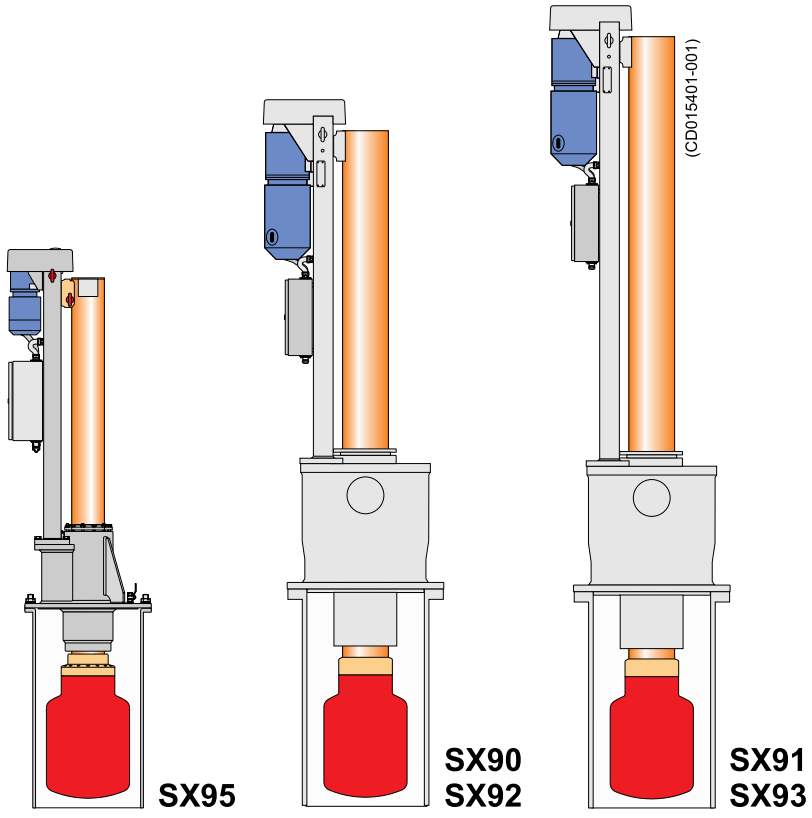
Several different hull unit models are available for the SX90 sonar. All the SX90 hull unit models are based on the same transducer, but with different stroke lengths and mounting flange dimensions. In this manual, these differences are pointed out whenever applicable.

The Simrad SX92 is the standard hull unit providing 1,2 m stroke length. The SX93 is the optional “long” version offering 1,6 m stroke length. The SX90 and SX91 versions are also available as special orders for existing trunk installations with flange bolts PCD of 620 mm.

Table 4 SX90 Series models

Hull unit	Registration number	Order number
SX90	307473	307472
SX91	307475	307474
SX92	307477	307476
SX93	307479	307478
The label with the registration number is located on the side of the gantry.		

Figure 15 SX90 Hull unit models



- **SX90**: This hull unit has 1.2 m stroke length, and it is designed for maximum speed 24 knots. It will fit on the old Simrad trunk with 620 mm pitch centre diameter (PCD).

- **SX91**: This hull unit has 1.6 m stroke length, and it is designed for maximum speed 20 knots. It will fit on the old Simrad trunk with 620 mm pitch centre diameter (PCD).
- **SX92**: This is the "standard" hull unit for the SX90 sonar. It has 1.2 m stroke length, and it is designed for maximum speed 24 knots. It will fit on a standard Simrad trunk with 680 mm pitch centre diameter.
- **SX93**: This hull unit has 1.6 m stroke length, and it is designed for maximum speed 20 knots. It will fit on a standard Simrad trunk with 680 mm pitch centre diameter.
- **SX95**: This hull unit has 1.0 m stroke length, and it is designed for maximum speed 12 knots. It will fit on a standard Simrad trunk with 540 mm pitch centre diameter.

Table 5 Main specifications for each model

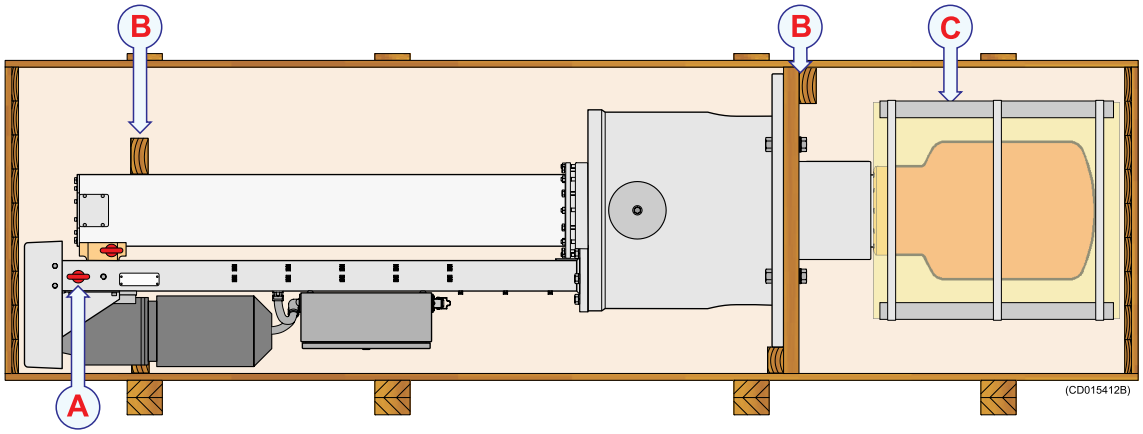
Parameter	**SX90**	**SX91**	**SX92**	**SX93**
Stroke length	1,2 m	1,6 m	1,2 m	1,6 m
Maximum speed	24 knots	20 knots	24 knots	20 knots
Flange diameter	676 mm	676 mm	761 mm	761 mm
No. of flange bolts	20	20	24	24
Flange bolts PCD	620 mm	620 mm	680 mm	680 mm
Trunk order no.	SP9-205825	SP9-205825	SP9-207516	SP9-207516

How to unpack the hull unit from its transport box

Note

The transducer is protected to prevent damage during transport and hull unit installation. This protection must remain attached while the hull unit is being manoeuvred into the sonar room.

Figure 16 Removing the hull unit from its transport box



A *Lifting eye on the hoisting unit*

B *Mounting hardware (wooden cradle and support construction)*

C *Transducer protection*

Procedure

Note

Do not remove the transducer protection (C) from the transducer until just before the hull unit is lowered onto the mounting trunk.

1 Remove the top cover of the wooden box.

2 Pull out all the nails marked with Indian ink.

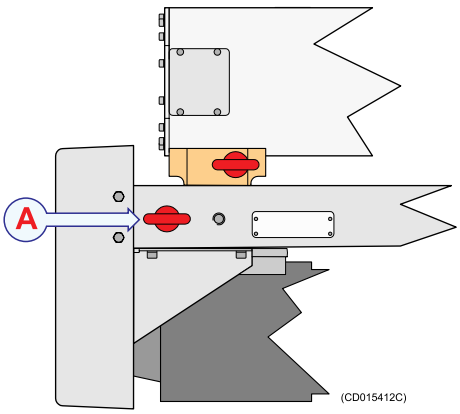
3 Remove the fastening hardware (**B**).

4 If you wish to reuse the box to hold the old hull unit, make sure that you keep all the fastening hardware used to secure the hull unit in the wooden box.

5 Fasten the lifting tackle to the two lifting eye bolts (**A**) on the top of the hoisting unit and lift the hull unit (with the transducer protection (**C**) in place) carefully out of the transportation box.

Figure 17 Use the correct lifting eye!

*There are two lifting eyes on each side of the hull unit: one on the hoisting unit and one on the top of the transducer shaft. Make sure that you use the lifting eye on the hoisting unit (**A**) when you lift the hull unit out of the transportation box!*



6 Make sure that you keep the transducer cable and connector dry. Watch these carefully to prevent them from being damaged, stuck or hooked on to protruding objects while manoeuvring the hull unit into the sonar room.

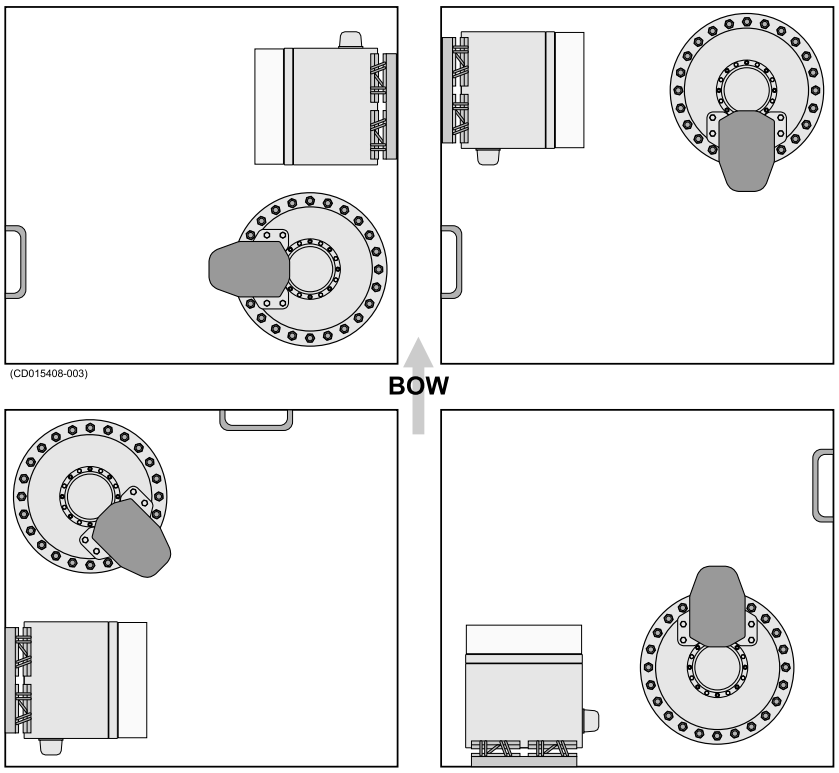
Hull unit mounting

The hull unit should normally be oriented with the hoisting/lowering motor pointing aft. If this orientation makes the Motor Control Unit attached to the hull unit difficult to access for maintenance purposes, the hull unit may be oriented in the most suitable position.

Note

The Motor Control Unit must never be physically dismounted from the Hull Unit.

Figure 18 Hull unit orientation examples



Hull unit mounting procedure

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Use a tackle to lower the hull unit (with the transducer protection in place) into the sonar room

2 ☐ Remove the blind cover from the trunk and check that the gasket is not damaged.

3 ☐ Store the blind cover in the sonar room for possible future use.

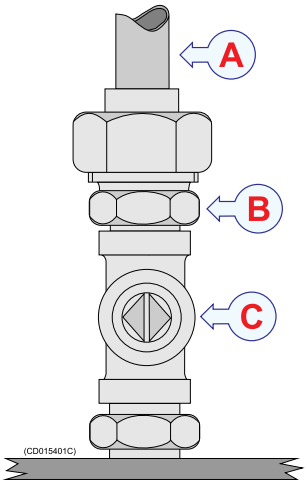
4 ☐ Remove the transducer protection and lower the hull unit carefully onto the trunk.

5 ☐ Tighten the flange nuts with a torque of approximately **470 Nm**. (On the SX95 hull unit, use 140 Nm.)

6 ☐ Keep the transducer cable and connector dry, and handle them with great care to prevent mechanical damage.

Bleeding air cock

Figure 19 Bleeding air cock



To avoid damage to the transducer by the transmission in air inside the trunk, a pipe with a minimum inside diameter of 10 mm must be attached to the air bleeding cock. This vent should be run with continuous rise to the main deck or through the vessel's side. Make sure the air bleeding cock is opened.

A *Minimum 10 mm internal diameter*

B *3/8" pipe thread*

C *Valve shown in opened position*

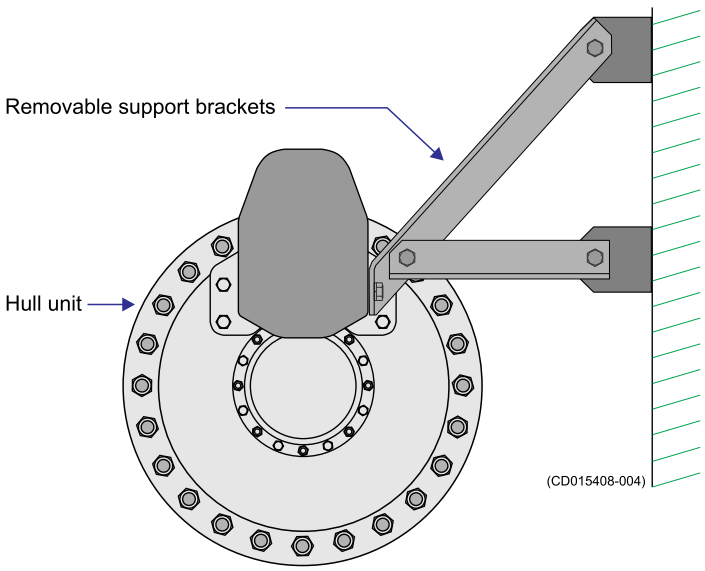
Mechanical support

Note

To ensure the safety of the sonar system and the vessel, it is very important that the mechanical support of the hull unit gantry is satisfactory.

To prevent unwanted vortex induced vibration, the hull unit must be secured to the bulkhead. Use the two holes provided on the gantry to mount support brackets in the fore-and-aft and sideways direction. It must be possible to remove the support brackets if maintenance is required.

Figure 20 Mechanical support



Note

If you do not install a proper mechanical support for the hull unit gantry, the guarantee will be void!

Transducer alignment

Irrespective of the hull unit orientation, the transducer shall not be mechanically aligned.

Transducer alignment is performed in the SX90 Processor Unit by rotating the echo presentation on the display. This is described in a dedicated section.

→ *Alignment of the sonar picture* on page 128

Hull unit installation check list

Perform a close visual inspection of the sonar room and the physical installation of the hull unit. Refer to the applicable requirements provided in section *Sonar room requirements* on page 34, and fill in the table below.

Table 6 Hull unit installation check list

Item	YES	NO
Are the access hatches satisfactory?		
Is the heating satisfactory?		
Is the insulation satisfactory?		
Is the ventilation satisfactory?		
Is the air vent pipe satisfactory?		
Is a bilge pump installed?		
Is the room lighting satisfactory?		
Is the sonar room suitably decked?		
Is the mechanical support of the hull unit satisfactory?		
Do you have satisfactory access to the Motor Control Unit?		

If the answer to any of these questions is NO, note down the deficiencies as instructed in *Installation remarks* on page 263.

TRANSCEIVER UNIT INSTALLATION

This chapter explains how to install the Simrad SX90 Transceiver Unit. The transceiver is normally positioned in the sonar room close to the hull unit.

Topics

- *Transceiver Unit preparations* on page 57
- *Transceiver Unit installation procedure* on page 58

Related topics

- *Sonar room requirements* on page 34

Cabinet outline dimension drawings

- *Transceiver Unit dimensions* on page 183
- *Processor Unit dimensions* on page 186
- *Operating Panel dimensions* on page 187

Transceiver Unit preparations

Free bulkhead space is required to mount the Transceiver Unit cabinet.

Provide ample space around the cabinet to allow for inspection, maintenance and parts replacement. Make sure that the cabinet door can be fully dismounted for unobstructed access to its internal parts.

Note

The cabinet must be mounted as a complete unit. The door must not be opened until the unit is securely fastened to the bulkhead.

Before you mount the Transceiver Unit, observe:

- The distance between the Hull Unit and the Transceiver Unit is restricted by the flexible transducer cable joining the two. Remember to take into consideration the slack necessary to lower the transducer.

Do not fasten the transducer cable to the Transceiver Unit until described later in the start-up procedure.

Note

The installation shipyard must provide all necessary installation drawings, and if required, these must be approved by the applicable authorities.

Observe the general sonar room requirements provided in section *Sonar room requirements* on page 34.

Transceiver Unit installation procedure

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Remove the two mounting brackets which are fastened to the shock absorbers on the Transceiver Unit.

Use the Allen key found in the plastic bag fastened to the upper shock absorber.

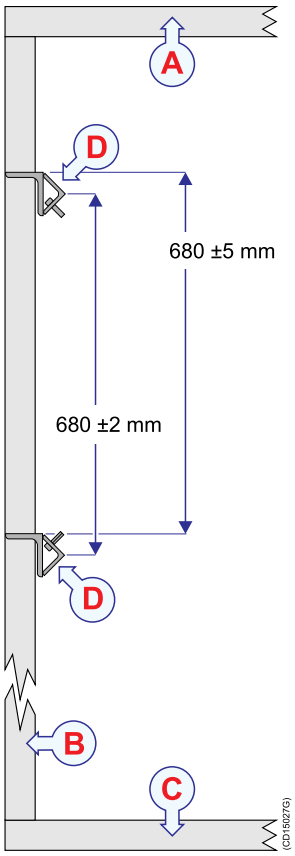
2 ☐ Weld the mounting brackets securely to the bulkhead.

3 ☐ Use a chain fall or similar device to lift the Transceiver Unit into position and bolt it to the mounting brackets.

Note that eight bolts are provided in the plastic bag fastened to the upper shock absorber.

4 ☐ Connect the grounding cable from the Transceiver Unit to the mounting bracket.

Figure 21 Installation of mounting brackets (1)



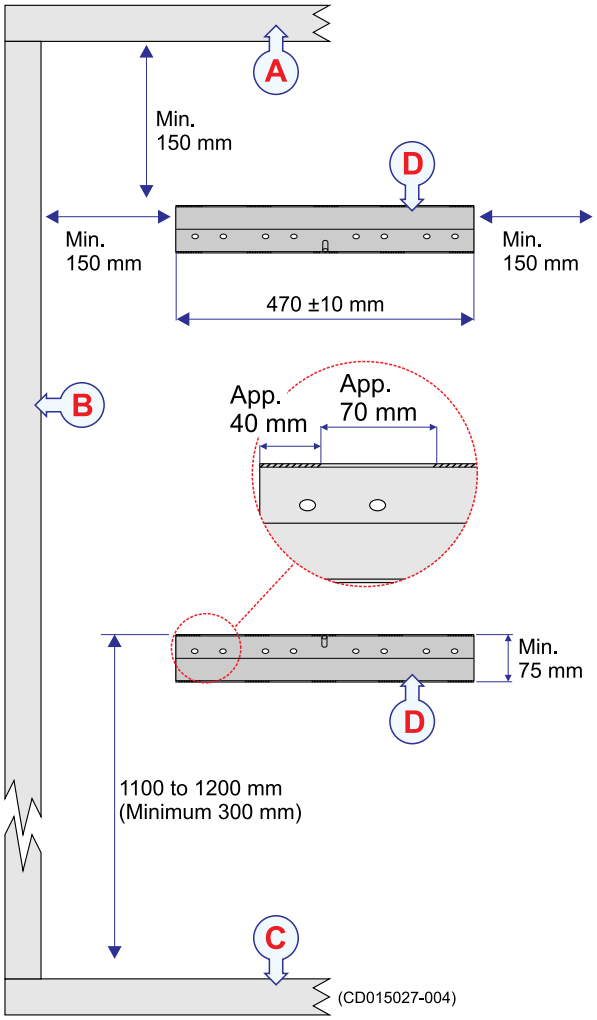
A *Deckhead*

B *Bulkhead*

C *Deck*

D *Angle bars with threaded holes for shock absorbers. These bars are supplied by Simrad.*

Figure 22 Installation of mounting brackets (2)



A *Deckhead*

B *Bulkhead*

C *Deck*

D *Angle bars with threaded holes for shock absorbers. These bars are supplied by Simrad.*

Figure 23 Installation of Transceiver Unit

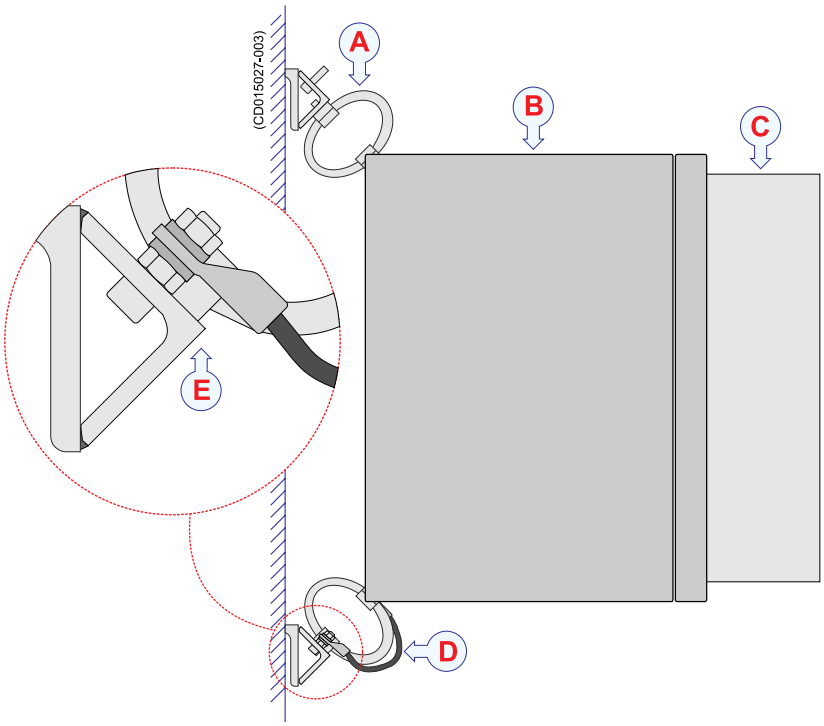
A *Upper shock absorber*

B *Transceiver Unit*

C *Heat Exchanger*

D *Grounding cable*

E *Grounding cable, detail*



WHEELHOUSE UNITS INSTALLATION

This chapter explains how to install the Simrad SX90 hardware units normally positioned in the wheelhouse. These units include:

- *Bracket*
- *Mounted to the TRU sub-rack*
- *Mounted to the BM MFU#3 cabinet*

  The mounting material will be included with telescopic rail delivery.
- *Operating panel*
- *Operating Panel power supply*
- *Processor Unit*
- *Audio amplifier with loudspeakers (option)*

Note

The installation shipyard must provide all necessary installation drawings, and if required, these must be approved by the applicable authorities.

Topics

- *Physical location of wheelhouse units* on page 61
- *Maximum distances between the units* on page 65
- *Installation of the colour display* on page 66
- *Installation of the Operating Panel* on page 66
- *Installation of the Operating Panel Power Supply* on page 67
- *Installation of the Processor Unit* on page 67
- *Installation of the amplifier and loudspeakers* on page 69

Cabinet outline dimension drawings

- *Transceiver Unit dimensions* on page 183
- *Processor Unit dimensions* on page 186
- *Operating Panel dimensions* on page 187

Physical location of wheelhouse units

On board routines and the listed installation requirements must be thoroughly discussed with the captain when selecting the locations for the Operating Panel and colour display.

Installation requirements

Installation of the wheelhouse units must be performed by qualified and trained personnel with regard to:

- The safe navigation of the vessel
- The "Compass safe distance" for each individual unit.
- Ergonomically correct operating and viewing heights.
- Maximum allowable cable distances between the various units.
- The installation areas are dry, well ventilated and free of excessive dust and vibration.
- Easy access to the cable connections on the back of the equipment is provided.
- Enough extra cable is allowed to facilitate maintenance and service by not having to disconnect the cables.

We strongly recommend that the Operating Panel is positioned in the same physical direction as the colour display, so that “up” on the operating panel is in parallel with “up” on the display. Experience has shown that this will make it easier when using the trackball to control the cursor.

Location of the colour display

The display monitor should be located so that it is best protected from glare which reduces readability. It may be:

- Panel mounted
- Desktop mounted
- Bulkhead mounted
- Overhead mounted

Refer to the display monitor’s instruction manual for the compass safe distance.

If several colour displays are mounted in the wheelhouse for use with various sonars, echo sounders and radar systems, we suggest that you install a display selector device. A display selector will allow you to set up the sonar (or any other system) to be viewed on any display, and this may be chosen depending on the current operations taking place. If a commercial display is used, observe the minimum technical requirements.

For more information, see *Installation of the colour display* on page 66.

Location of the Operating Panel

The Operating Panel provided with the Simrad SX90 contains all the controllers for the sonar operation. The built-in trackball allows you to operate the menu system on the sonar, but additional "short-cut" buttons have also been provided to access the most common functions directly. Tests have shown that this allows you to operate the sonar faster, and it reduces fatigue. We recommend that the Operating Panel is mounted in a nearly horizontal position, and within easy viewing range of the display unit. The compass safe distances to be allowed for when planning the unit's location are:

- Standard Compass: 0.3 m.
- Steering Compass: 0.2 m.

We strongly recommend that the Operating Panel is positioned in the same physical direction as the colour display, so that "up" on the operating panel is in parallel with "up" on the display. Experience has shown that this will make it easier when using the trackball to control the cursor.

For more information, see *Installation of the Operating Panel* on page 66.

Location of the Operating Panel Power Supply

The Operating Panel Power Supply supplied with the Simrad SX90 provides the stand-by power for the Operating Panel. The power supply connects to the rear side of the Processor Unit. We recommend that the power supply is placed in the immediate vicinity of the Processor Unit.

For more information, see *Installation of the Operating Panel Power Supply* on page 67.

Location of the Processor Unit

The Processor Unit should be installed inside a console, in a cabinet or on a desk. Make sure that adequate ventilation is available to avoid overheating. The compass safe distances to be allowed for when planning the unit's location are:

- Standard Compass: 1.8 m
- Steering Compass: 1.2 m

For more information, see *Installation of the Processor Unit* on page 67.

Location of the amplifier and loudspeakers

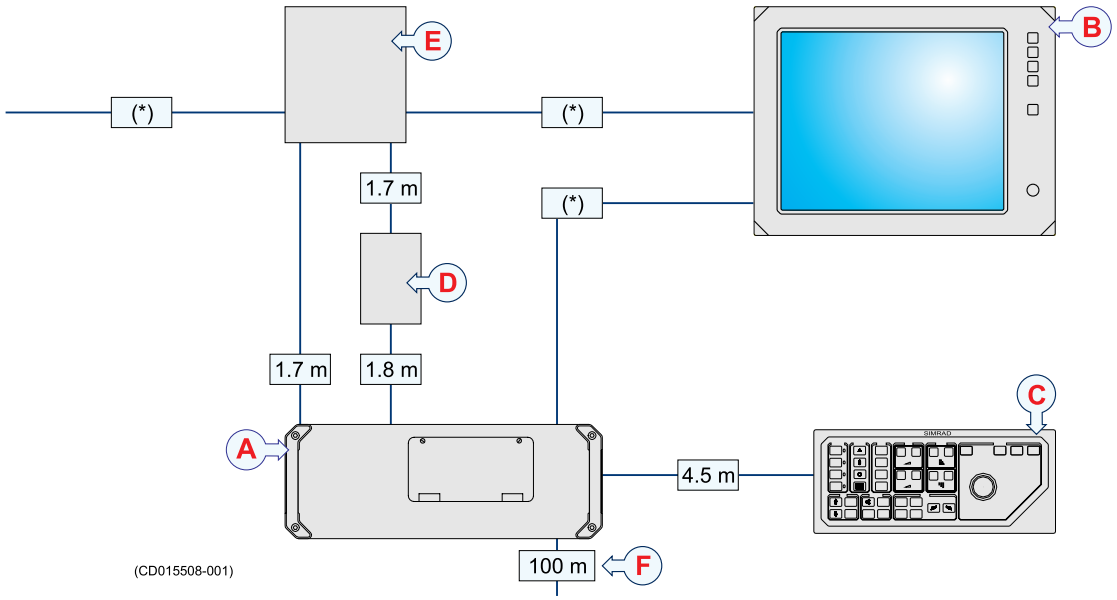
The audio system must include an amplifier and one or more loudspeakers. Choosing a location and installation of the items should be done with regard to the functionality provided, such as access to the volume control. The output from the sonar system may also be connected to an existing stereo system in the wheelhouse. The compass safe distance to be allowed for when planning the location of the audio system depends on the type of system used.

For more information, see *Installation of the amplifier and loudspeakers* on page 69.

Maximum distances between the units

Observe the maximum distances between the wheelhouse units.

Figure 24 Maximum distances between the wheelhouse units



All measurements are in meters.

(*) The length of these cables are determined by the applicable manufacturers.

A *Processor Unit*

B *Bracket*

C *Mounted to the TRU sub-rack*

D *Mounted to the BM MFU#3 cabinet*

The mounting material will be included with telescopic rail delivery.

E *Operating panel*

F *Operating Panel power supply*

G *Uninterrupted power supply*

H *Ethernet cable between sonar room and wheelhouse*

Installation of the colour display

Different display units are available as optional equipment. For installation and operation of the chosen display unit, refer to the manual supplied with the unit.

Installation procedure

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

Observe the *Maximum distances between the units* on page 65.

1 ☐ Install the colour display unit as described the applicable documentation provided with the unit.

- The display must be located so that it is best protected from glare which reduces readability.
- The display may be mounted in a panel, on the desktop or bulkhead, or overhead.
- Make sure that adequate ventilation is available to avoid overheating.
- The compass safe distance must be allowed for when planning the unit's location.
- Make sure that the installation allows for the physical movements and forces normally experienced on a vessel.
- Make sure that enough space is provided for maintenance work.

Installation of the Operating Panel

Installation procedure

The Operating Panel is designed to be recessed in a panel.

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

Observe the *Maximum distances between the units* on page 65.

1 ☐ Mount the Operating Panel in an almost horizontal position to facilitate operation of the trackball.

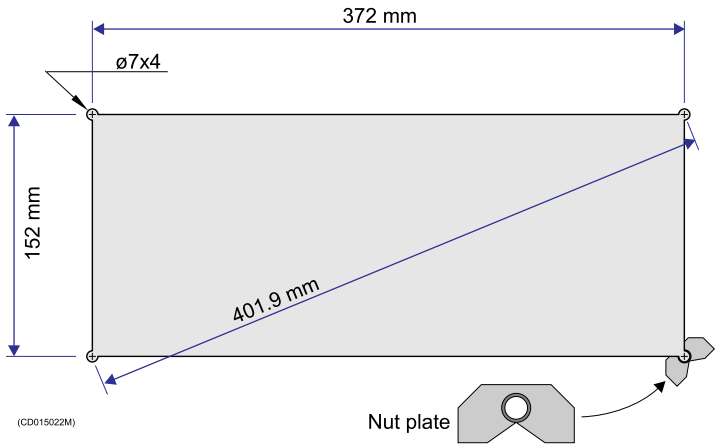
- The necessary mounting hardware (four screws, four nut plates and four bolt covers) are supplied in the standard delivery.
- *Operating Panel dimensions* on page 187

2 ☐ Drill and cut the panel opening as shown in the figure.

3 ☐ Mount the Operating Panel using the supplied hardware.

A Position the four nut plates shown in the figure.

Figure 25 Operating Panel cut-out



B Use a 3 mm Allen key to fasten the four special bolts.

C Mount the bolt covers in the four corners of the Operating Panel.

Installation of the Operating Panel Power Supply

No specific installation procedure applies to the Operating Panel Power Supply.

Installation of the Processor Unit

The Processor Unit should be mounted on the deck or shelf inside a console, cabinet or desk.

It must be mounted close to the Operating Panel and the colour display.

Preparations

Provide ample space around the computer. This is necessary to reach and use the front and rear mounted USB connectors, and the CD/DVD player. It is also important to allow for easy access to all the cables, and to provide for inspection, maintenance and parts replacement.

Make sure that the computer can be fully opened for unobstructed access to its internal parts.

Installation procedure

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

Observe the *Maximum distances between the units* on page 65.

1 ☐ Prepare the mounting location.

- *Processor Unit dimensions* on page 186

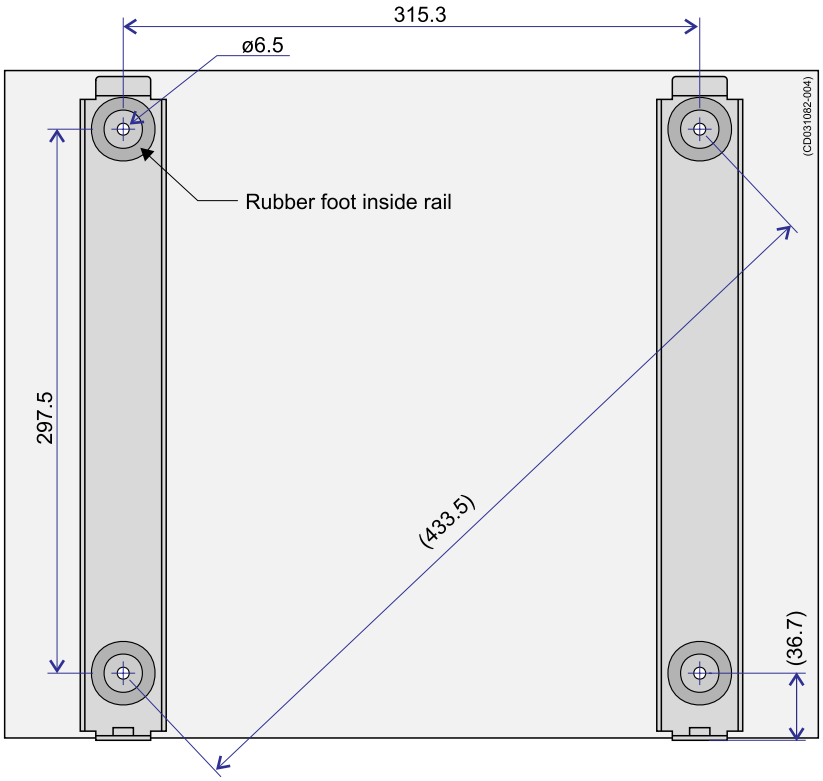
2 ☐ Disassemble the base rails from the Processor Unit by removing the two front base rail screws.

3 ☐ Attach the base rails as shown in the figure.

Note

Note that the four rubber bushings must be mounted on top of the base rails. These are required to provide vibration and shock absorption between the base rails, and the rails mounted on the Processor Unit.

Figure 26 Installation of the Processor Unit



4 ☐ Mount the Processor Unit onto the base rails.

1 Hook the unit onto the rails at the rear end.

2 Press it down.

3 Secure the Processor Unit with the two front base rail screws

Software backup and restore

Procedures for software backup and restore are provided in chapter *Final tests and measurements*.

See *Processor Unit backup and restore* on page 167.

Installation of the amplifier and loudspeakers

For installation and operation of the chosen audio system, refer to the manual supplied with the unit.

Related topics

- *Audio output* on page 25

UPS INSTALLATION

In order to ensure continuous operation of the Simrad SX90 independent of varying quality of the vessel's mains supply, the use of uninterrupted power supplies (UPS) is required.

Two UPS units are used. One is used to power the wheelhouse units, while the other is used to power the Transceiver Unit.

The installation of these units must be performed as described in the applicable documentation provided by the manufacturer. Ensure that you install the UPS unit in such a way that maintenance is easily carried out.

The UPS units recommended by Simrad are listed in section *Additional required items* on page 20.

Related topics

- *Uninterrupted Power Supply (UPS)* on page 20

CABLE LAYOUT AND INTERCONNECTIONS

This chapter provides the cable plan and cable installation requirements for the Simrad SX90.

Note that detailed information about cable specifications, termination and connectors are provided. All cables are provided by Simrad unless otherwise specified. In order to provide for maintenance and to allow for vibration, make sure that some slack is provided for all cables.

Note

Before you perform the sonar cabling, ensure that the mains circuit breaker for the sonar system is switched off. Do not mount the flexible transducer cable to the Transceiver Unit. This will be described later.

Note

All electronic installations and corresponding wiring must be in accordance with the vessel's national registry and corresponding maritime authority and/or classification society. If no such guidelines exist, we recommend that Det Norske Veritas (DNV) Report No. 80-P008 «Guidelines for Installation and Proposal for Test of Equipment» is used as a guide. Observe Basic cable requirements on page 234.

Topics

- *Cable plan* on page 72
- *List of cables* on page 74
- *Cable procedures* on page 79
- *Processor Unit serial lines* on page 94
- *References to detailed cable drawings and specifications* on page 98

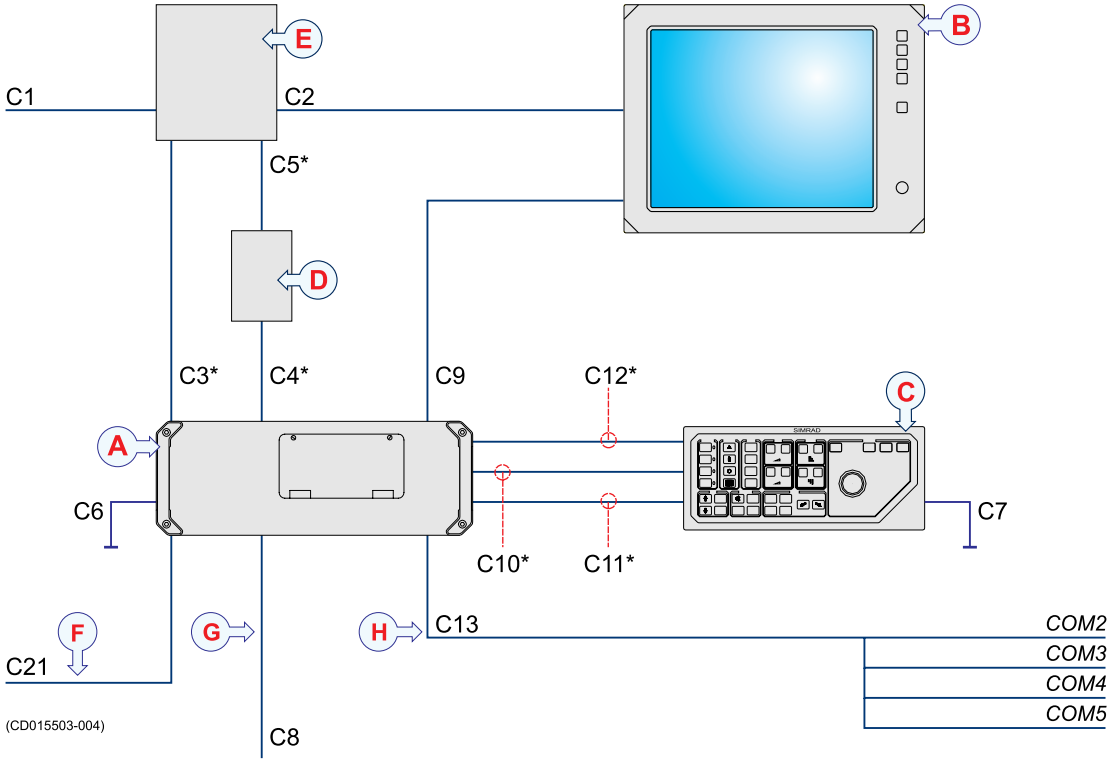
Related topics

- *Cabling principles* on page 212
- *Cables to peripheral devices* on page 213
- *Cable drawings* on page 217
- *Basic cable requirements* on page 234

Cable plan

Cables identified with an asterisk (*) are supplied with the sonar.

Figure 27 Wheelhouse cables



A *Processor Unit*

B *Display Unit*

C *Operating Panel*

D *Operating Panel power supply*

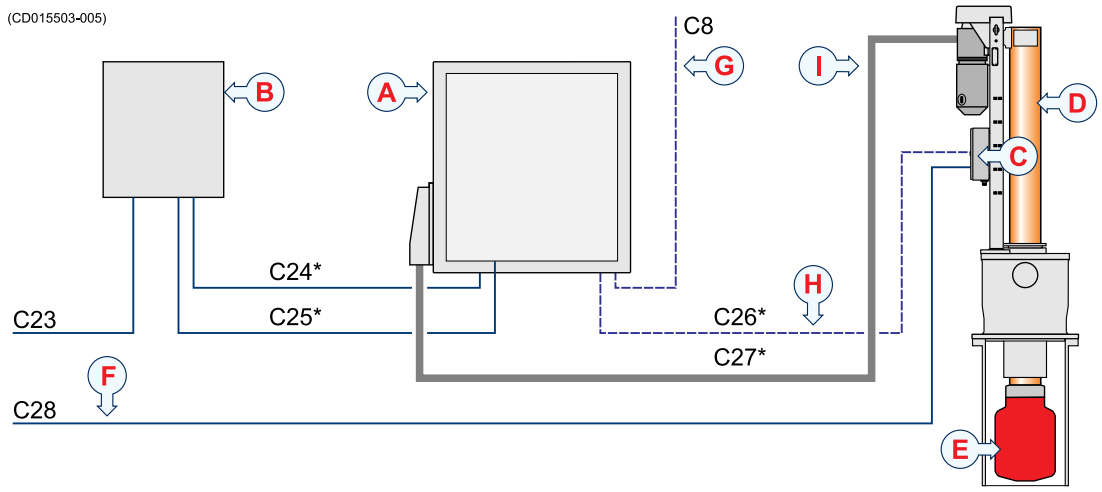
E *Uninterrupted power supply*

F *Scientific output*

G *Ethernet cable between sonar room and wheelhouse*

H *Serial lines*

Figure 28 Sonar room cables



A *Transceiver Unit*

B *Uninterrupted power supply*

C *Motor Control Unit*

D *Hull Unit*

E *Transducer*

F *3–phase AC mains to Motor Control Unit*

G *Ethernet control cable to Motor Control Unit*

H *Ethernet communication between sonar room and wheelhouse*

I *Transducer cable*

List of cables

Sonar cables

C1 **SX90/C01 AC mains to Uninterrupted Power Supply in the wheelhouse**

- This is a standard AC mains cable. It is provided with the Uninterrupted Power Supply. If the AC mains connector on the cable does not fit, replace it with a suitable connector.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect AC mains to the Uninterrupted Power Supply* on page 79
- *AC mains (IEC 60320)* on page 222

C2 **SX90/C02 AC mains to colour display**

- This cable is provided with the colour display. It is a standard commercial cable.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect AC mains to the colour display* on page 85
- *AC mains (IEC 60320)* on page 222

C3 **SX90/C03 AC mains to Processor Unit**

- This cable is provided with the sonar. It is a standard mains supply cable.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect AC mains and ground to the Processor Unit* on page 84
- *AC mains (IEC 60320)* on page 222

C4 **SX90/C04 +12 Vdc from Operating Panel power supply to Processor Unit**

- This is a commercial power supply. It is provided with the sonar. The powered cable is physically fixed to the power supply body.
- *Connect the Operating Panel power supply to the Processor Unit* on page 83
- *DC power supply* on page 225

C5 **SX90/C05 AC mains to Operating Panel power supply**

- This cable is provided with the sonar, it is physically fixed to the power supply.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect the Operating Panel power supply to the Processor Unit* on page 83
- *AC mains with IEC320/C7* on page 224

C6 **SX90/C06 Ground cable for Processor Unit**

- This cable must be provided by the installation shipyard. It is a standard commercial ground cable.
- *Connect AC mains and ground to the Processor Unit* on page 84
- *Vessel ground* on page 221

C7 **SX90/C07 Ground cable for Operating Panel**

- This cable must be provided by the installation shipyard. It is a standard commercial ground cable.
- *Connect ground to the Operating Panel* on page 86
- *Vessel ground* on page 221

C8 **SX90/C08 Ethernet cable from Processor Unit to Transceiver Unit**

- This cable is used between the Processor Unit in the wheelhouse and the Transceiver Unit in the sonar room. It is a high quality Ethernet cable. It can be provided by the installation shipyard, or ordered from Simrad.

  Note

  It is very important that a high quality Ethernet cable is used. You must use CAT-5E quality or better.

- *Connect the Processor Unit to the Transceiver Unit* on page 87
- *RJ45 Ethernet, straight* on page 226

C9 **SX90/C09 Video cable from Processor Unit to colour display**

- This cable is normally provided with the display. It is a standard commercial cable.
- *Connect the video cable from the Processor Unit to the colour display* on page 80
- *VGA/SVGA Display* on page 227
- *DVI–I Display* on page 229

C10 **SX90/C10 Operating Panel USB cable to Processor Unit**

- This cable is provided with the sonar. It is a standard USB data cable with length 4,5 meters.
- *Connect the USB cable from the Operating Panel to the Processor Unit* on page 81
- *Universal Serial Bus (USB)* on page 228

C11 **SX90/C11 Operating Panel "Dual cable" to Processor Unit**

- This cable is provided with the sonar. It is a special dual cable with one common 15-pin connector leading to two separate 9-pin connectors in the two other ends of the cable. The cable length is 4,5 meter.
- *Connect the Operating Panel "Dual cable"* on page 82
- *Operating Panel "Dual"* on page 233

C12 **SX90/C12 Power cable to Operating Panel** (same as C11)

C13 **SX90/C13 Serial line interfaces (COM2 through COM5)**

- By default, four serial lines are provided for interface to peripheral units. These are identified as **COM2** through **COM5**. A dedicated adapter is provided with the delivery to provide four male 9–pin D-sub connectors, and special screw terminals are also provided for these. Other cables must be provided by the installation shipyard.
- *Connecting the course gyro* on page 147
- *Connecting the speed log* on page 146
- *Course gyro interface setup and test* on page 149
- *Speed log interface test* on page 148
- *Positioning system interface setup and test* on page 150
- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

C14 **Not used**

C15 **SX90/C15 Audio output**

- This cable must be provided by the installation shipyard. The cable is connected to an external audio system.
- *Connect audio cables for external powered speakers* on page 93
- *Mini-jack-to-phono audio cable* on page 220
- *Powered speaker system* on page 231

C16 **Not used**

C17 **Not used**

C18 **Not used**

C19 **Not used**

C20 **Not used**

C21 **SX90/C21 Ethernet interface for scientific output** (optional)

- This cable must be provided by the installation shipyard. Use a high quality Ethernet cable fit for the bandwidth provided.
- *Connect the Ethernet cable for scientific output* on page 92
- *RJ45 Ethernet, straight* on page 226

C22 **Not used**

C23 **SH90/C23 AC mains to Uninterrupted Power Supply in the sonar room**

- This is a standard AC mains cable. It is provided with the Uninterrupted Power Supply. If the AC mains connector on the cable does not fit, replace it with a suitable connector.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect AC mains to the Uninterrupted Power Supply* on page 79
- *AC mains (IEC 60320)* on page 222

C24 **SH90/C24 AC mains to Transceiver Unit**

- This cable is provided with the sonar. It is a standard commercial cable.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect AC mains to the Transceiver Unit* on page 88
- *AC mains (IEC 60320)* on page 222

C25 **SX90/C25 AC mains to Heat Exchanger**

- This is a standard AC mains cable. It is provided readily fixed to the Heat Exchanger cabinet.
- Typical cable length is between 1,5 and 2 meters. If this is too short, you must use an extension cable, or make your own power cable.
- *Connect AC mains to the Heat Exchanger* on page 91
- *AC mains (IEC 60320)* on page 222

C26 **SX90/C26 Ethernet cable from the Transceiver Unit to the Motor Control Unit**

- This cable is provided with the sonar. The part number is 312152. It is a high quality Ethernet cable, and it is 8 meters long.

- *Connect the Transceiver Unit to the Motor Control Unit* on page 90
- *RJ45 Ethernet, straight* on page 226

C27 SX90/C27 Transducer cable

- This cable is provided with the sonar. It contains one cable pair for each of the transceiver channels in a special screened cable.
- The transducer cable is physically attached to the top of the transducer shaft, and connects to a special connector on the side of the Transceiver Unit.
- Do not connect the transducer cable until specifically instructed to do so by the setup procedure.
- Cable length is 4,5 meters.
- *Transducer cable* on page 94

C28 SX90/C28 3–phase AC power to Motor Control Unit

- This cable must be provided by the installation shipyard. It is a special AC mains cable.

  Note

  This cable can be prepared for installation, but it must NOT be connected to the Motor Control Unit until specifically instructed by the setup procedure.

- *Connect AC mains to the Motor Control Unit* on page 89
- *AC mains to Motor Control Unit* on page 223

Cable procedures

Observe the following procedures to do the sonar cabling.

Note that detailed information about cable specifications, termination and connectors are provided in the referenced sections. All cables are provided by Simrad unless otherwise specified. In order to provide for maintenance and to allow for vibration, make sure that some slack is provided for all cables. To make sure that each procedure is followed, tick off each task after it has been done.

Note

Before you perform the sonar cabling, ensure that the mains circuit breaker for the sonar system is switched off.

Do not mount the flexible transducer cable to the Transceiver Unit. This will be described later.

Connect AC mains to the Uninterrupted Power Supply

There are two Uninterrupted Power Supply (UPS) locations; the sonar room and the wheelhouse. Standard commercial AC mains cables are used, and these are provided with the Uninterrupted Power Supply units. If the AC mains connectors on the cables do not fit, replace with a suitable connectors.

Procedure

For cable details, see *AC mains (IEC 60320)* on page 222.

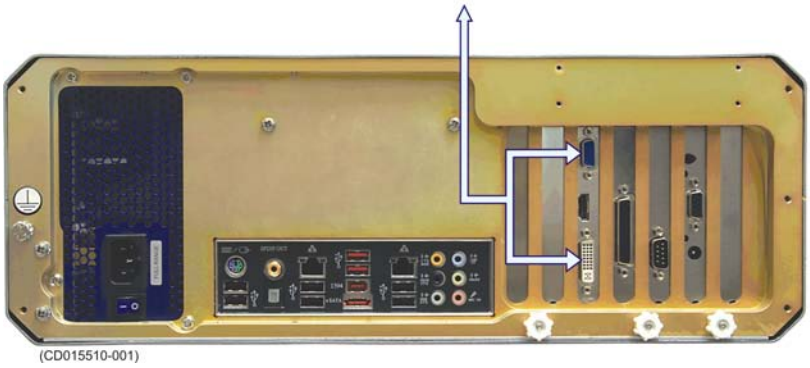
1 ☐ Connect the Uninterrupted Power Supply in the wheelhouse to the vessel's AC mains (**SX90/C1**).

2 ☐ Connect the Uninterrupted Power Supply in the sonar room to the vessel's AC mains (**SX90/C23**).

Connect the video cable from the Processor Unit to the colour display

This is a standard commercial cable. It is often physically attached to the display, and terminated in the “computer end” with a male 15-pin Delta connector (VGA) or a special DVI connector. The graphic adapter on the rear side of the Processor Unit provides two connectors, one for VGA and one for DVI-I. Choose the connector that fits your cable. If you have two displays both can be connected simultaneously, but they will show the same picture.

Figure 29 Display cable connections



Note

Keep the display cable as short as possible. If the cable is too long, it may pick up electric noise, and this will degrade the image quality.

Procedure

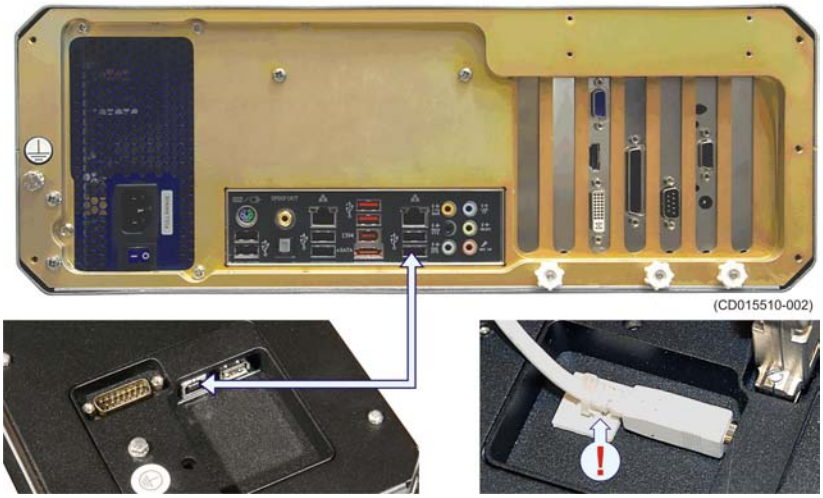
For cable details, see *VGA/SVGA Display* on page 227 and *DVI–I Display* on page 229.

1 ☐ Connect the display cable (**SX90/C09**) from the appropriate slot on the rear side of the Processor Unit to the colour display.

Connect the USB cable from the Operating Panel to the Processor Unit

This is a standard commercial USB data cable. It connects between the Operating Panel and the Processor Unit. The cable length is 4,5 meters. It has a quadratic USB connector in the Operating Panel end (B-plug), and rectangular USB connector in the Processor Unit end (A-plug).

Figure 30 USB cable connections



Procedure

For cable details, see *Universal Serial Bus (USB)* on page 228.

1 ☐ Connect the cable from the B-type USB connector under the Operating Panel to one of the vacant USB connectors on the rear side of the Processor Unit (**SX90/C10**).

2 Secure the connector under the Operating Panel with a cable strip as indicated with the (**!**).

Connect the Operating Panel "Dual cable"

This is a special dual cable from the Operating Panel to the Processor Unit. This cable has one common 15-pin connector leading to two separate 9-pin connectors in the two other ends of the cable. The cable is included in the standard delivery, and the cable length is 4,5 meter. The cable is connected as follows:

1 15-pin D-connector (common end) to Operating Panel.

2 9-pin female D–connector to Processor Unit slot **J5**.

3 9-pin male D–connector to Processor Unit slot **J6**.

Figure 31 "Dual cable" connections

Procedure

For cable details, see *Operating Panel "Dual"* on page 233.

1 ☐ Connect the single end of the cable to the D-connector under the Operating Panel.

2 ☐ Connect one end to the D-connector in slot **J5** on the rear side of the Processor Unit (**SX90/C11**).

3 ☐ Connect one end to the D-connector in slot **J6** on the rear side of the Processor Unit (**SX90/C12**).

Connect the Operating Panel power supply to the Processor Unit

In order to facilitate the sonar's on/off function, the Operating Panel must be fed a permanent stand-by power. This supply power is provided by a small commercial power supply connected to the rear side of the Processor Unit. If the AC mains connector on the cable does not fit, replace it with a suitable connector.

The mains voltage for the Operating Panel power supply is 115 or 230 Vac, and it will automatically sense the current supply voltage.

Figure 32 Operating Panel power supply connections

Procedure

For cable details, see *AC mains with IEC320/C7* on page 224 and *DC power supply* on page 225.

1. Locate the commercial power supply.
2. Connect the power supply to the AC mains using the cable provided (**SX90/C05**).
3. Insert the DC plug into the socket on slot **6** on the rear side of the Processor Unit (**SX90/C04**).
4. Arrange the cables to prevent them from accidentally disconnecting during heavy seas or other disturbances.

Connect AC mains and ground to the Processor Unit

The mains voltage for the Processor Unit is 115 or 230 Vac, and it will automatically sense the current supply voltage.

The AC mains cable is a standard commercial item. If the AC mains connector on the cable does not fit, replace it with a suitable connector.

Figure 33 Processor Unit AC mains and grounding cables

Procedure

For cable details, see *Vessel ground* on page 221 and *AC mains (IEC 60320)* on page 222.

1 ☐ Connect the Uninterrupted Power Supply (UPS) in the wheelhouse to the vessel's AC mains.

2 ☐ Connect the AC mains cable (**SX90/C03**) from the Processor Unit to the UPS.

3 ☐ Connect the grounding cable (**SX90/C06**) to the Processor Unit.

The grounding cable must be provided by the installation shipyard. It must be connected to the nearest grounding point.

Connect AC mains to the colour display

The AC mains cable is a standard commercial item. If the AC mains connector on the cable does not fit, replace it with a suitable connector.

Procedure

For cable details, see *AC mains (IEC 60320)* on page 222.

1 ☐ Connect the AC mains cable (**SX90/C02**) from the Uninterrupted Power Supply in the wheelhouse to the colour display.

This is a standard commercial mains cable.

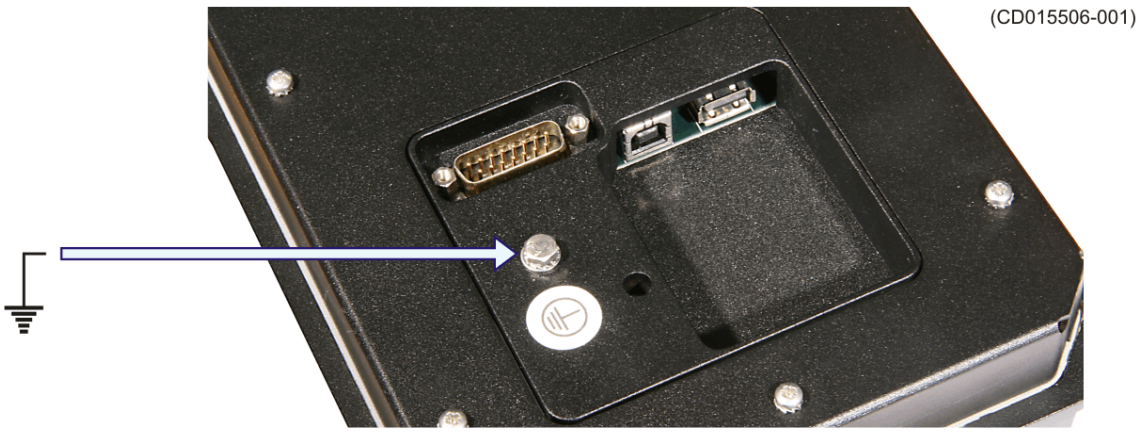
2 ☐ Connect a grounding cable to the colour display if this is specified in the installation instructions provided by the manufacturer.

The grounding cable must be provided by the installation shipyard. It must be connected to the vessel's ground in the fuse box (or other common grounding point).

Connect ground to the Operating Panel

This is a standard grounding cable.

Figure 34 Ground connection on the Operating Panel



Procedure

For cable details, see *Vessel ground* on page 221.

1 ☐ Connect the grounding cable (**SX90/C07**) to the Operating Panel.

A connection bolt is located under the unit. The grounding cable must be provided by the installation shipyard. It must be connected to the vessel's ground in the fuse box (or other common grounding point).

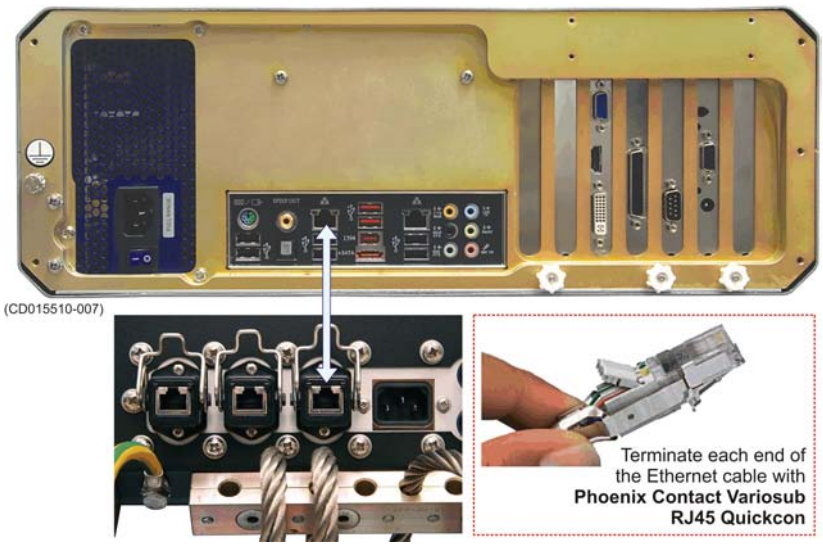
Connect the Processor Unit to the Transceiver Unit

This is an Ethernet cable. It can be ordered from Simrad, or it can be provided by the installation shipyard.

Note

It is very important that a high quality Ethernet cable is used. You must use CAT-5E quality or better.

Figure 35 Processor Unit to Transceiver Unit connections



Procedure

For cable details, see *RJ45 Ethernet, straight* on page 226.

1 ☐ Connect the Ethernet cable (**SX90/C08**) from the left Ethernet socket on the connection panel on the rear side of the Processor Unit, to the right Ethernet socket under the Transceiver Unit.

We recommend that an additional spare Ethernet cable is installed between the wheelhouse and the sonar room.

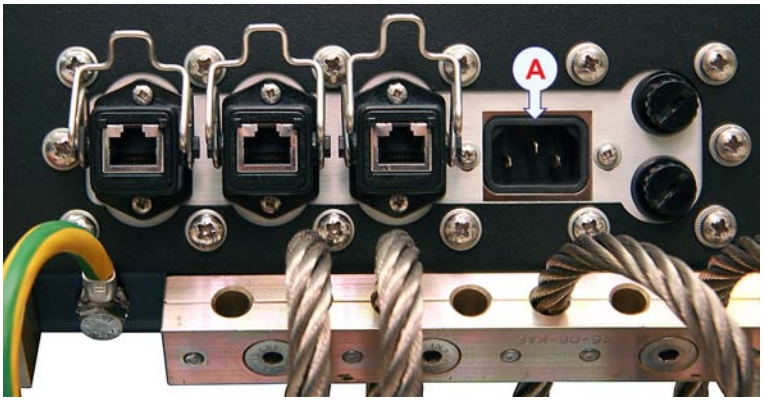
Each end of the Ethernet cables must be terminated with a Phoenix Contact **Variosub RJ45 Quickcon** connector. Connectors (and mounting instructions) are provided in the sonar delivery.

Connect AC mains to the Transceiver Unit

The mains voltage for the Transceiver Unit is 230 Vac.

The AC mains cable is a standard commercial item. It is connected to a socket at the bottom of the Transceiver Unit. If the AC mains connector on the cable does not fit, replace it with a suitable connector.

Figure 36 Transceiver Unit AC mains socket (A)



Procedure

For cable details, see *AC mains (IEC 60320)* on page 222.

1 ☐ Connect the AC mains cable (**SX90/C24**) from the Uninterrupted Power Supply in the sonar room to the bottom socket on the Transceiver Unit.

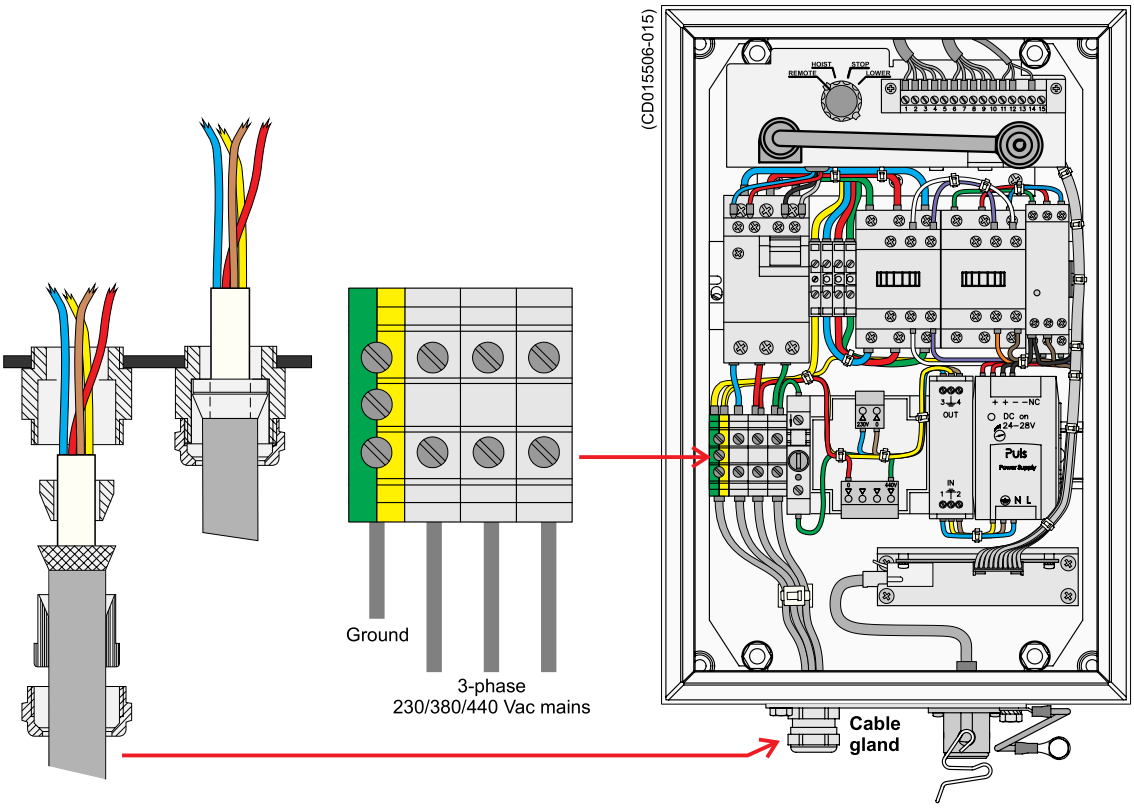
Connect AC mains to the Motor Control Unit

This is a special mains cable for 3-phase AC mains. It must be provided by the installation shipyard. Observe the cable specifications, see *AC mains to Motor Control Unit* on page 223.

Note

You must use minimum 4 x 2.5 mm² cable. Ensure that the screen is properly terminated in the cable gland.

Figure 37 3–phase AC mains connections



For cable details, see *AC mains to Motor Control Unit* on page 223.

1 ☐ Connect the 3–phase AC mains cable (**SX90/C28**) from the Motor Control Unit to the vessel's 3-phase AC mains.

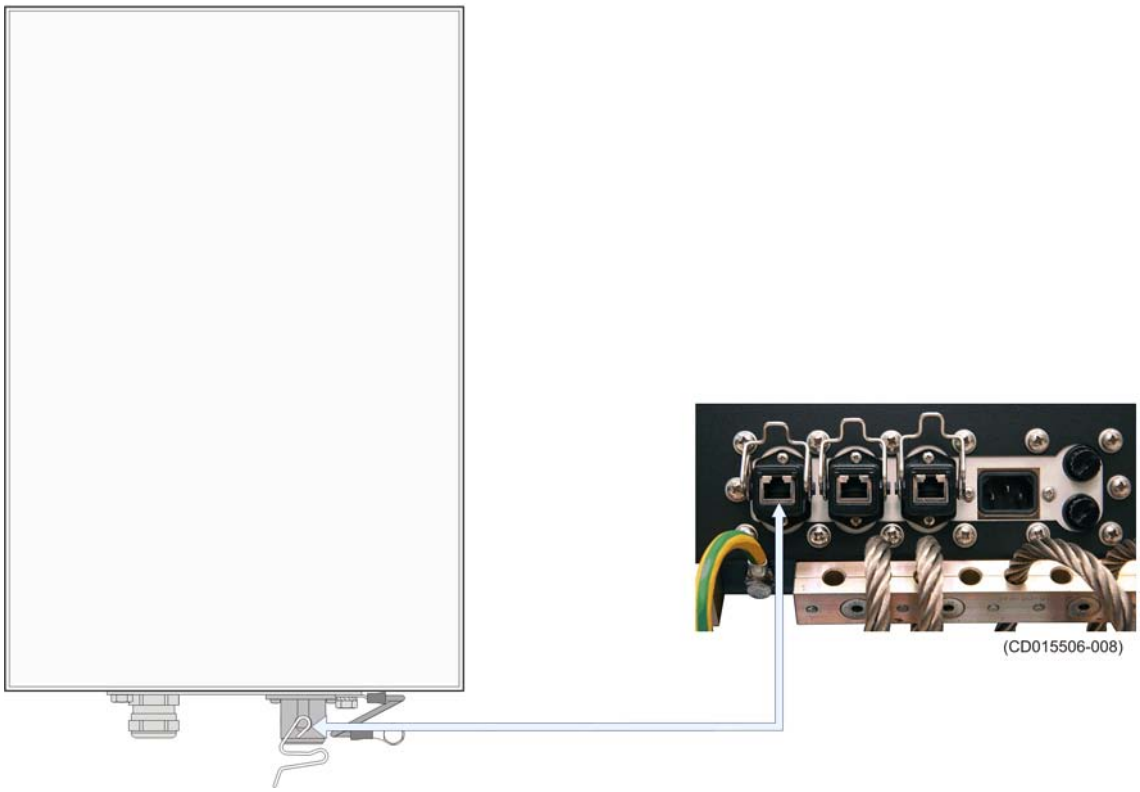
Note

DO NOT apply 3–phase power to the Motor Control Unit until instructed by the applicable start-up procedure.

Connect the Transceiver Unit to the Motor Control Unit

This is an Ethernet cable.

Figure 38 Transceiver Unit to Motor Control Unit Ethernet connection



For cable details, see *RJ45 Ethernet, straight* on page 226.

1 ☐ Locate the terminated Ethernet patch cable **(SX90/C26)** provided with the Transceiver Unit.

2 ☐ Connect the Ethernet cable from the left Ethernet socket under the Transceiver Unit to the Ethernet socket on the Motor Control Unit.

Connect AC mains to the Heat Exchanger

This is a standard AC mains cable. It is provided readily fixed to the Heat Exchanger cabinet. If the AC mains connector on the cable does not fit, replace it with a suitable connector.

Note

The mains voltage for the Heat Exchanger is either 230 Vac or 115 Vac. Make sure that you have the correct mains voltage. To check the rated power for the Heat Exchanger, see the registration label on the front of the unit.

Procedure

For cable details, see *AC mains (IEC 60320)* on page 222.

1 ☐ Connect the AC mains cable (**SX90/C25**) on the Heat Exchanger to the Uninterrupted Power Supply in the sonar room.

Connect the Ethernet cable for scientific output

This is an Ethernet cable. It must be provided by the installation shipyard. Use a commercial high quality Ethernet cable suitable to match the bandwidth on the ship's network.

Procedure

For cable details, see *RJ45 Ethernet, straight* on page 226.

1 ☐ Connect the Ethernet cable (**SX90/C21**) from the additional Ethernet socket on the rear side of the Processor Unit.

2 ☐ Terminate the other end of the Ethernet cable in a suitable access point for the ship's network.

Connect audio cables for external powered speakers

This procedure explains how to connect a powered speaker system to the SX90. The audio system comprises two loudspeakers and a power supply. One of the loudspeakers is “active”, it contains the amplifier, and various controllers for the sound volume and quality. The “active” loudspeaker also provides a headphones socket.

Figure 39 The (A) identifies the audio output on the rear side of the Processor Unit

Procedure

For cable details, see *Powered speaker system* on page 231.

1 ☐ Connect the audio cable (**SX90/C15**) (mini-jack connectors on each end) from the audio output socket on the rear side of the Processor Unit.

The output socket is identified with a green ring.

2 ☐ Connect the other end of the audio cable to the relevant socket on the rear side of the “active” loudspeaker.

3 ☐ Connect the “passive” speaker to the output connector on the rear side of the “active” speaker.

4 ☐ Connect the power supply to the sockets on the rear side of the “active” speaker.

Transducer cable

The transducer cable is provided by Simrad. It is physically connected to the top of the transducer shaft, and terminated in the other end with a large connector.

Note

Do not mount the flexible transducer cable to the Transceiver Unit. This operation is described later.

Installation of interface cables to peripheral equipment

The Processor Unit provides several connections for peripheral devices. These are all serial line connections. They may be used to connect to any external device. For further details about these connections, refer to:

- *Cables to peripheral devices* on page 213
- *Interfacing peripheral equipment* on page 134

Cable drawings and specifications

- *Moxa CP-134U-I serial adapter* on page 218

Processor Unit serial lines

By default, the Processor Unit provides five serial line connections, where one (**COM1**) is dedicated for the Operating Panel. The four remaining serial lines are connected by means of an adapter cable to a **Moxa CP134U-I** 4–port optical isolated serial interface board.

Serial line support

The 4-port serial board supports the following serial line interface formats:

- **Port 1 = Sonar COM2**: RS-232/422/485
- **Port 2 = Sonar COM3**: RS-232/422/485
- **Port 3 = Sonar COM4**: RS-422/485
- **Port 4 = Sonar COM5**: RS-422/485

By manufacturer default, all these serial connections are set to **RS-422** format. In order to change this to RS-232 or RS-485 format, dedicated jumpers or DIP switches must be changed.

Note

Note that only ports 1 and 2 support RS-232 format.

Jumper and DIP switch settings

Use the 10-pin jumper arrays and the two DIP switches to set ports 1 and 2 to RS-232, RS-422, or RS-485. Use the two DIP switches to set ports 3 and 4 to RS-422 or RS-485.

- **RS–232**: In order to use Port 1 (**COM2**) or Port 2 (**COM3**) as RS-232 interfaces, the relevant jumper arrays for Port 1 or Port 2 must be moved. Note that ports 3 and 4 do not support RS-232 format.
- **RS-422**: All four ports can be set to RS-422 using the two jumpers and the right-hand DIP switch S2.
- **RS-485**: All four ports can be set to RS-485 using the two jumpers and the right-hand DIP switch S2. Additionally, each port can be selected for a 2-wire or 4-wire connection type using the left-hand DIP switch S1.

Figure 40 Location of the jumpers and DIP switches

A *Jumper for Port 1 interface setup*

B *Jumper for Port 2 interface setup*

C *DIP-switch S1 for 2–wire or 4–wire setup (all ports)*

D *DIP-switch S2 for RS-422 or RS-485 selection (all ports)*

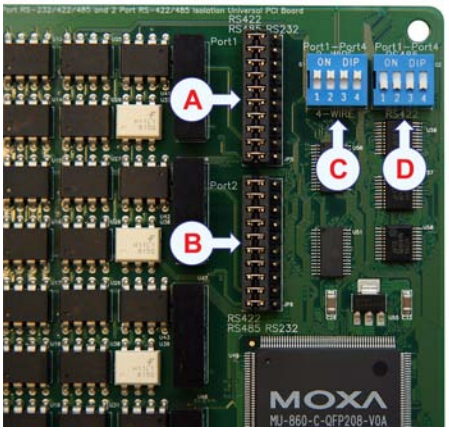


Table 7 Processor Unit serial lines jumper and DIP switch settings

Port	Interface	Jumper	S1	S2
Port 1	RS-232	Port 1 to right		
	RS-422	Port 1 to left		1 to OFF
	2–wire RS-485	Port 1 to left	1 to ON	1 to ON
	4–wire RS-485	Port 1 to left	1 to OFF	1 to ON

Table 7 Processor Unit serial lines jumper and DIP switch settings (cont'd.)

Port	Interface	Jumper	S1	S2
Port 2	RS-232	Port 2 to right		
	RS-422	Port 2 to left		2 to OFF
	2–wire RS-485	Port 2 to left	2 to ON	2 to ON
	4–wire RS-485	Port 2 to left	2 to OFF	2 to ON
Port 3	RS-422			3 to OFF
	2–wire RS-485		3 to ON	3 to ON
	4–wire RS-485		3 to OFF	3 to ON
Port 4	RS-422			4 to OFF
	2–wire RS-485		4 to ON	4 to ON
	4–wire RS-485		4 to OFF	4 to ON
Note: [Blank] = Not active or not used. Ports 3 and 4 do not support RS-232.				

Table 8 Processor Unit serial lines DIP switch settings, examples

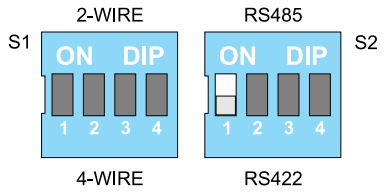
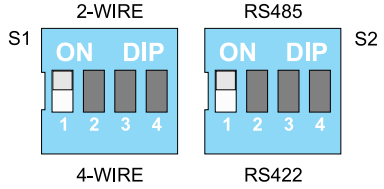
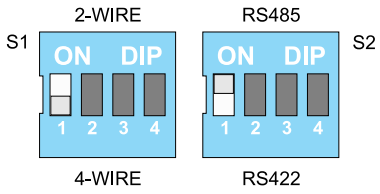
DIP switch	Setting
	Port 1 set for RS-422 transmission.
	Port 1 set for 2-wire RS-485 transmission.

Table 8 Processor Unit serial lines DIP switch settings, examples (cont'd.)

DIP switch	Setting
	Port 1 set for 4-wire RS-485 transmission.

Adapter cable

An adapter cable is included in the delivery. This allows for connection of four individual 9-pin D-sub connectors to the serial interface board. Four 9-pin D-sub connectors with screw terminals, and a number of adapter nuts for connection to the adapter cable, are also included in the delivery.

Figure 41 Screw connector adapter for 9–pin D—sub connectors

Table 9 Moxa CP-134U-I 9–pin D-connector converter

Pin	RS-232	RS-422	RS485 (4–wire)	RS485 (2–wire)
1	DCD	TXD-(A)	TXD-(A)	—
2	RxD	TXD+(B)	TXD+(B)	—
3	TxD	RXD+(B)	RXD+(B)	Data-(B)
4	DTR	RXD-(A)	RXD-(A)	Data-(A)
5	GND	GND	GND	GND
6	DSR	—	—	—
7	RTS	—	—	—
8	CTS	—	—	—
9	—	—	—	—

References to detailed cable drawings and specifications

All detailed information about the cables are provided in the appendix. See *Cable drawings* on page 217.

Cable drawings and specifications

- *Moxa CP-134U-I serial adapter* on page 218
- *Mini-jack-to-phono audio cable* on page 220
- *Vessel ground* on page 221
- *AC mains (IEC 60320)* on page 222
- *AC mains to Motor Control Unit* on page 223
- *AC mains with IEC320/C7* on page 224
- *DC power supply* on page 225
- *RJ45 Ethernet, straight* on page 226
- *VGA/SVGA Display* on page 227
- *Universal Serial Bus (USB)* on page 228
- *DVI–I Display* on page 229
- *Powered speaker system* on page 231
- *Operating Panel "Dual"* on page 233

START-UP PROCEDURES

The procedures in this chapter shall be carried out once all the SX90 hardware units have been installed, and the cabling is finished.

When you carry out these procedures, make sure that you only perform those tasks described, and in the given order.

Check off every item in the procedure as you carry on.

Topics

- *Starting up the Hull Unit* on page 99
- *Starting the wheelhouse units* on page 109
- *Checking the Operating Panel* on page 110
- *Starting up the Transceiver Unit* on page 118
- *Checking the hoist/lower system* on page 119
- *Perform self-noise test* on page 124
- *Starting up the sonar system* on page 124
- *Alignment of the sonar picture* on page 128
- *Adjusting the stabilisation sensor offset* on page 130
- *Defining own ship parameters* on page 131

Starting up the Hull Unit

Observe the following procedure to start up the Hull Unit.

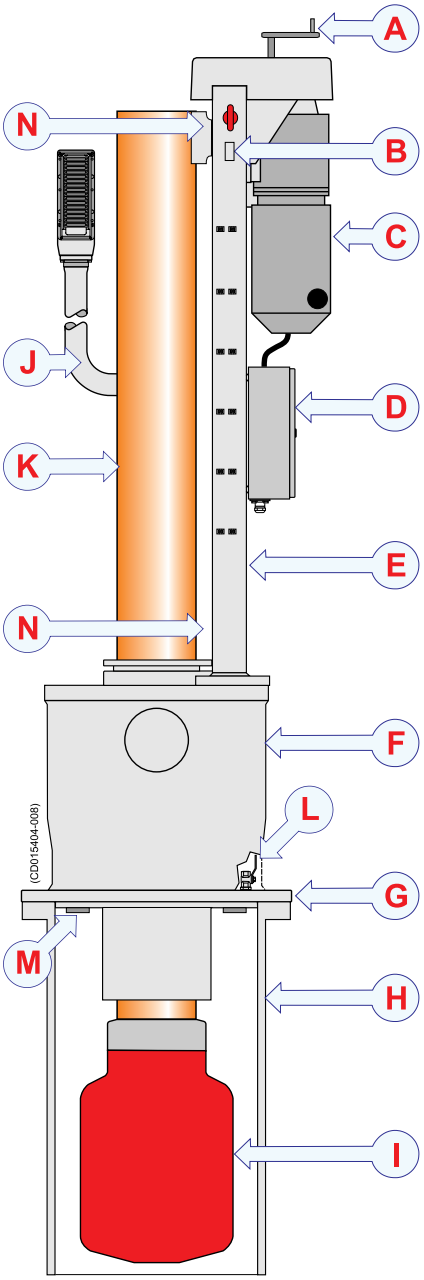
WARNING

Before you start up the sonar equipment on a recently launched vessel, make sure that the depth under the keel is sufficient for the transducer to be lowered safely.

When you start up the equipment on board a vessel in dry dock, check first under the vessel and inside the sonar room. Personnel, tools and other potential obstructions must be kept clear of the transducer and related lowering and hoisting machinery to avoid personal injury or damage to the equipment.

Hull unit familiarization

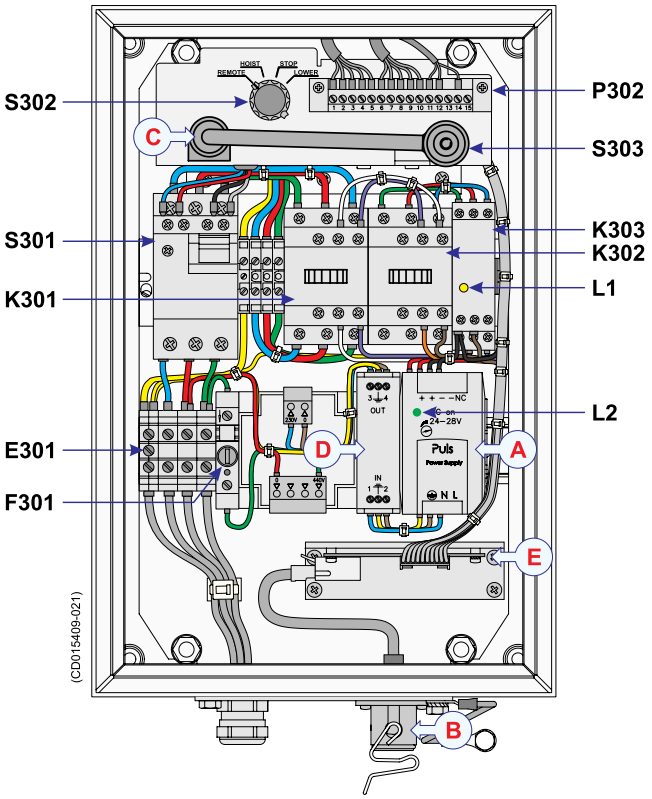
Figure 42 Hull unit familiarization



A *Hand crank for manual hoisting and lowering*
B *Identification label*
C *Hoisting motor*
D *Motor Control Unit*
E *Hoisting unit*
F *Transducer shaft sleeve*
G *Mounting flange*
H *Installation trunk*
I *Transducer*
J *Transducer cable*
K *Transducer shaft*
L *Air bleeding cock*
M *Zinc anodes*
N *Upper and lower limit switches*

Motor Control Unit familiarization

Figure 43 Motor Control Unit familiarization



During normal operational conditions, the following two indicator lamps shall be lit:

- **L1** indicates that the phase watch relay **K303** is activated. This mean that the 3-phase voltage is applied to the hoist/lower system, and that the three phases are correctly connected with regard to the training direction of the hoisting motor.
- **L2** indicates that the internal +24 Vdc power supply for the control electronic is operational.

A *Internal 24 Vdc power supply*

B *Ethernet connector*

C *Hand crank*

D *Mains filter*

E *Hull Unit Controller circuit board*

F301 *Fuse for internal power supply*

E301 *Terminal strip for AC mains input*

K301 *Hoisting contactor*

K302 *Lowering contactor*

K303 *Phase watch relay*

L1 *Yellow indicator light*

L2 *Green indicator light*

S301 *Motor protecting switch*

S302 *Hoist/lower switch*

S303 *Hand crank with safety switch*

P302 *Connector for hull unit limit switches and rotation sensor*

Functional check

Procedure

Before you commence with the start-up procedure, check the following items.

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Check that the 3-phase mains fuses are disconnected in the ship's fuse box.

2 ☐ Use a spanner to open the door on the Motor Control Unit which is mounted on the Hull Unit gantry.

3 ☐ Locate the motor protecting switch **S301**, and check that the operating handle is pressed down to *OFF* position.

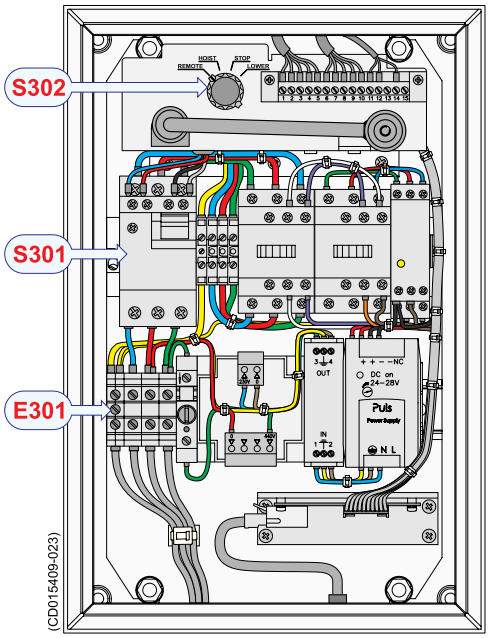
4 ☐ Check that the hoist/lower switch **S302** in the Motor Control Unit is set in the *STOP* position.

Apply 3-phase AC power

This procedure explains how to connect 3-phase AC power to the Motor Control Unit.

To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

Figure 44 Motor Control Unit with S301 and E301



1 ☐ Locate the motor protecting switch **S301** in the Motor Control Unit, and check that the operating handle is pressed down to *OFF* position.

2 ☐ Check that the hoist/lower switch **S302** in the Motor Control Unit is set in the *STOP* position.

3 ☐ Re-insert the 3-phase mains fuses for the hull unit in the ship's fuse box.

4 ☐ Measure the three-phase voltage on the terminals **E301** in the Motor Control Unit.

Write down the measured voltage here:

Supply voltage:

5 ☐ Adjust the release current on the motor protecting switch **S301** according to the three-phase voltage:

- 230 Vac: **10 A** (maximum)
- 380/440 Vac: **6,5 A**

Check the hoisting motor's 3–phase AC connections

In order to ensure that the hoisting motor operates properly, and to avoid serious damage to the motor, you must check that the motor connections are made in accordance with the supplied 3–phase voltage.

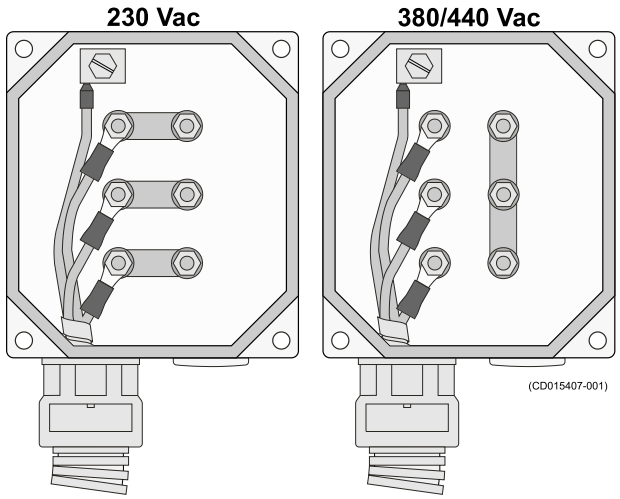
To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Remove the 3-phase mains fuses for the hull unit in the vessel's fuse box.

2 ☐ Remove the cover for the mains connection on the motor.

3 ☐ Refer to the illustration, and check if the motor connections are made in accordance with the supplied 3–phase voltage.

Figure 45 Mains connection to the hoisting motor



Note

The order of the connection wires must not be changed!

4 ☐ If the connections do not match the 3–phase voltage, rewire to make them correspond to the measured voltage.

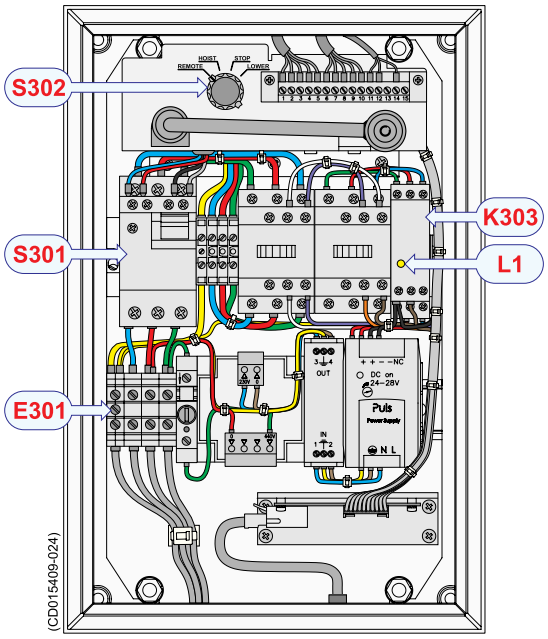
5 ☐ Remount the mains connections cover on the hoisting motor.

6 ☐ Re-insert the 3-phase mains fuses for the hull unit in the vessel's fuse box.

Check 3–phase connection for correct rotation

The Motor Control Unit is equipped with a *Phase Watch Relay* (**K303**), which prevents operation of the hoisting motor if the 3-phase connections are wrong with respect to the motor's rotation direction.

Figure 46 Motor Control Unit with S302, S301, E301, K303 and LED L1



To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Check that the hoist/lower switch **S302** in the Motor Control Unit is set in the *STOP* position.

2 ☐ Switch on the motor protecting switch **S301** by pressing the operating handle upwards to *ON* position.

3 ☐ Check that the LED **L1** on the front of the *Phase Watch Relay* (**K303**) is lit.

4 ☐ If the LED is not lit, observe the following procedure:

- **1** Disconnect the ship's 3-phase fuses.
- **2** Change two of the 3-phase connections on the terminal **E301** in the Motor Control Unit.
- **3** Re-insert the 3-phase fuses in the ship's fuse box.
- **4** Check again that the LED on the front of the *Phase Watch Relay* (**K303**) is lit.

5 ☐ Switch off the motor protecting switch **S301** by pressing the operating handle downwards to *OFF* position.

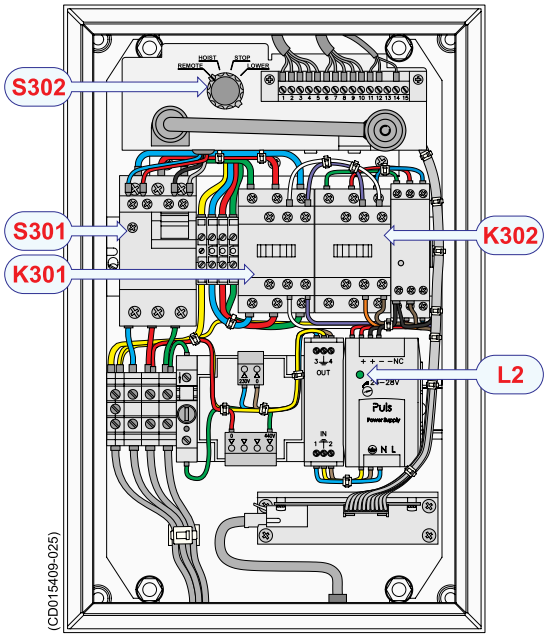
Check the contactor operation

Normally, in this part of the test procedure, the transducer shaft will be in upper position with the upper limit switch activated.

Note

This operational test of the hoist/lower contactors will not require the 3-phase power to be applied to the motor.

Figure 47 Motor Control Unit with S301, S302, K301, K302 and L2



To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Locate the motor protecting switch **S301**, and check that the operating handle is pressed down to *OFF* position.

2 ☐ Check that the LED indicator **L2** on the front of the 24 Vdc power supply is lit.

3 ☐ Set the hoist/lower switch **S302** to *HOIST* position.

4 ☐ Check that the hoisting contactor **K301** is not activated.

If the contactor was activated, press the upper limit switch **S304** upwards, and check that the contactor is deactivated.

5 ☐ Set the hoist/lower switch **S302** to the *LOWER* position.

6 ☐ Check that the lowering contactor **K302** is activated.

7 ☐ Press the lower limit switch **S305** downwards.

8 ☐ Check that the contactor is deactivated while activating the switch.

9 ☐ Locate the hand crank inside the Motor Control Unit.

10 ☐ Remove the hand crank from its storage position.

11 ☐ Check that the contactor is deactivated.

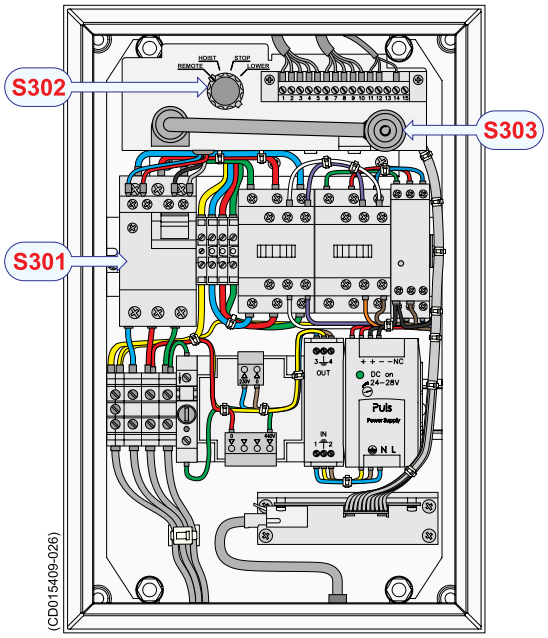
Do not place the hand crank back into its storage position.

12 ☐ Set the hoist/lower switch **S302** to the *STOP* position.

Verify correct hoist and lower functionality

The hull unit is now all powered up, and the final functional test can take place.

Figure 48 Motor Control Unit with S301, S302 and S303



To make sure that the procedure is followed correctly, and in the right order, tick off each task after you have done it.

1 ☐ Verify that the hand crank is removed from its storage position in the Motor Control Unit.

2 ☐ Switch on the motor protecting switch **S301** by pressing the operating handle upwards to *ON* position.

3 ☐ Set the hoist/lower switch **S302** to the *LOWER* position.

4 ☐ Check the training direction of the hoisting motor by very briefly pressing the hand crank safety switch **S303**.

5 ☐ If the transducer shaft was hoisted, perform the following procedure:

1 Disconnect the vessel's 3-phase mains fuses.

2 Change two of the 3-phase connections in the mains connection box on the motor.

3 Re-insert the 3-phase mains fuses in the vessel's fuse box.

4 Check that the transducer shaft is lowered when briefly pressing the hand crank safety switch **S303**.

6 ☐ Set the hoist/lower switch **S302** to the *STOP* position.

7 ☐ Put the hand crank back to its storage position in the Motor Control Unit.

8 ☐ Check if there is sufficient space under the keel to lower the transducer.

9 ☐ Make sure that the flexible transducer cable is in such a position that the transducer can be lowered without stretching or hard-bending the cable.

Note

Watch the cable carefully during the next steps in this procedure!

10 ☐ Set the hoist/lower switch **S302** to *LOWER* position to lower the transducer all the way down.

Lowering will be stopped automatically when the top of the transducer shaft makes contact with the lower limit switch **S305**.

If necessary, the lowering operation can easily be stopped in any position by setting the switch **S302** to *STOP* position.

11 ☐ Set the hoist/lower switch **S302** to *HOIST* position to hoist the transducer back up.

Hoisting will be stopped automatically when the top of the transducer makes contact with the upper limit switch **S304**.

If necessary, the hoisting operation can easily be stopped in any position by setting the switch **S302** to *STOP* position.

12 ☐ Repeat the hoist/lower operation to find the best position for a permanent fastening of the flexible transducer cable.

13 ☐ Set the hoist/lower switch **S302** to *STOP*.

14 ☐ Switch off the motor protecting switch **S301** by pressing the operating handle downwards to *OFF* position.

Starting the wheelhouse units

Note

In order to prevent inadvertent use of the sonar, the AC mains plug must be disconnected when the vessel is in dry dock. Operating the sonar with the transducer in air may cause serious damage to the system.

Topics

- *Initial start-up of the wheelhouse units* on page 109
- *How to set up the sonar to retrieve simulated sonar echoes* on page 109

Initial start-up of the wheelhouse units

Observe the following procedure to start up the sonar for the first time. The start-up procedure for daily use is described in the operator and reference manuals.

1 ☐ Connect the AC mains plug to the Processor Unit, and ensure that 115 or 230 Vac is present.

2 ☐ Locate the power switch on the rear side of the Processor Unit, and switch power on.

3 ☐ Power up the display unit.

4 ☐ Press the **Power** button on the Operating Panel for approximately two seconds to start the sonar.

5 ☐ Observe that the green LED next to the **Power** button on the Operating Panel starts blinking.

- The sonar is now loading up the sonar program. After approximately one minute, the sonar menu will be displayed.

How to set up the sonar to retrieve simulated sonar echoes

Observe the following procedure to set up the display to retrieve simulated sonar echoes.

1 Move the cursor to the **Setup** tab on the right-hand side of the main menu, and press the **Select** button.

Observe that the **Setup** menu is displayed.

2 Move the cursor to the **Test** button in the **Setup** menu, and press the **Select** button on the Operating Panel.

Observe that the **System test** menu appears in the menu field.

3 Move the cursor to the **Installation Menu** button and press the **Select** button.

Observe that the **Installation** menu appears at the top of the screen.

4 Move the cursor to **Simulation** and press the **Select** button on the Operating Panel.

5 Select **Modes →Auto**.

6 Check that simulated echoes are displayed on the screen after a few seconds. If not, check that the tilt angle in the upper left-hand corner is set to 0 degrees.

Checking the Operating Panel

The simulated echoes makes it possible to test out most of the operational functions without starting up the Transceiver Unit.

Note that the buttons on the Operating Panel are organized in fields. Each field has a name that describes the main functions carried out by its respective buttons.

Figure 49 Operating Panel fields

For more information about the Operating Panel, see the *SX90 Reference manual*.

Functional test

Observe the following procedure to check a selection of the operational functions.

Markers

This test procedure verifies that the various markers can be established and removed.

1 Check the *Target Marker*.

a Use the trackball on the Operating Panel, and move the cursor to the echo area.

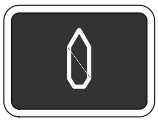
b Press the **Target Marker** button.

c Check that a numbered triangle appears in the position of the cursor.

d ☐ Ok

2 Check the *Own Ship Marker*.

a Press the **Own Ship Marker** button.



b Check if a square symbol appears at the ship's symbol.

c ☐ Ok

3 Remove *Target Marker* and *Ship Marker*.

a Use the trackball to move the cursor to the **Objects** tab on the right-hand side of the menu.

b Press the **Select** button on the Operating Panel.

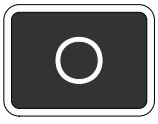
c Click the **Delete All** button on the **Objects** menu.

d Check that both the *Target Marker* and the *Ship Marker* disappear.

e ☐ Ok

4 Check the *Circle Marker*.

a Press the **Circle Marker** button.



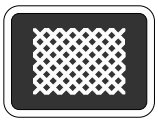
b Check if a circle appears centred around the cursor.

c Press the button once more, and check that the circle marker disappears.

d ☐ Ok

5 Check the *Gear marker*.

a Press the **Gear Marker** button.



b Check that a *Circle marker* appears next to the ship symbol.

c Press again to bring up the *Net Buoy Marker* at the ship symbol.

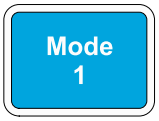
d Press a third time to remove the *Circle marker*.

e ☐ Ok

Modes

By means of the four **Mode** buttons in the Mode field on the Operating Panel, you can choose between the four most commonly used display modes.

1 Press all the four **Mode** buttons in random order.



2 Check that different display modes are selected.

3 ☐ Ok

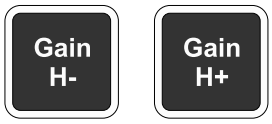
Horizontal gain

Check the horizontal gain read-outs.

1 Press the **Mode 2** button to select mode *270°/Vertical*.

2 Click the **Horizontal** tab to bring up this menu.

3 Press the **Gain H-** and **Gain H+** buttons in the Gain field on the Operator Panel repeatedly.



4 Check that the Gain read-out in the **Horizontal** menu and on the top of the tilt indicator changes from 0 to 50.

5 ☐ Ok

Horizontal range

Check the horizontal range read-out.

1 Press the **Mode 2** button to select mode *270°/Vertical*.

2 Press the **Range H-** and **Range H+** buttons in the Range field on the Operator Panel repeatedly.

3 Check that the Range read-out in the **Horizontal** menu and on the top of the tilt indicator changes accordingly.

4 ☐ Ok

Vertical gain

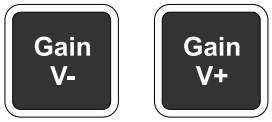
Check the vertical gain read-outs.

1 Press the **Mode 2** button to select mode *270°/Vertical*.

2 Select mode *270°/Vertical*.

3 Click the **Vertical** tab to bring up this menu.

4 Press the **Gain V-** and **Gain V+** buttons in the Gain field on the Operator Panel repeatedly.



5 Check that the Gain read-out in the **Vertical** menu changes from 0 to 50.

6 ☐ Ok

Vertical range

Check the vertical range read-out.

1 Press the **Mode 2** button to select mode *270°/Vertical*.

2 Press the **Range V-** and **Range V+** buttons in the Range field on the Operator Panel repeatedly.

3 Check that the Range read-out in the **Vertical** menu changes accordingly.

4 ☐ Ok

Full screen

Check the *Full screen* function. This function will remove the menu system from the sonar screen.

1 Press the **Menu** button in the Cursor field.

2 Check that the menu disappears for a full screen echo presentation.

3 Press the button once again to recall the menu.

4 ☐ Ok

View menu

The **View** menu is a short-cut menu that appears next to the cursor to offer specific functions.

1 Move the cursor to any position inside the echo area.

2 Press the **View** button in the Cursor field.

3 Check that the **View** short-cut menu appears.

4 Press the **Select** button to remove the menu.

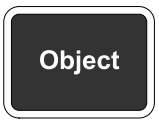
5 ☐ Ok

Object menu

The **Object** menu is a short-cut menu that appears next to the cursor to offer specific functions.

1 Move the cursor to any position inside the echo area.

2 Press the **Object** button in the Cursor field.



3 Check that the **Object** short-cut menu appears.

4 Press the **Select** button to remove the menu.

5 ☐ Ok

Manual and automatic tilt

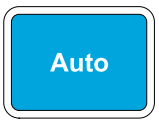
The tilt can be adjusted both on the Operator Panel and in the menu system. You will now check the functionality and the read-out of the tilt.

1 Select the **Horizontal** menu.

2 Press **Tilt up** and **Tilt down** (arrow) buttons in the Tilt field repeatedly.

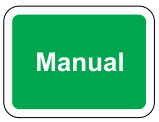
3 Check that the tilt read-out in the menu corresponds with the tilt indicator shown in the top left corner of the display.

4 Press the **Auto** button in the Tilt field.



5 Check that the tilt limits appear on the tilt indicator shown in the top left corner of the display.

6 Press the **Manual** button to stop the automatic tilt program.



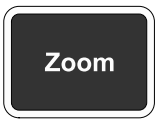
7 ☐ Ok

Zoom view

The **Zoom** button allows you to enlarge echoes on the display.

1 Press the **Mode 1** button to select mode *Bow up*.

2 Move the cursor to an echo, and press the **Zoom** button in the Various field.



3 Check that the echo is made larger (zoomed in).

4 Press the **Zoom** button one more time.

5 Check that the echo is brought back to its normal size.

6 ☐ Ok

Off centre

The **Off centre** button allows you to move the ship symbol away from its normal position at the centre of the display.

1 Move the cursor to any position inside the echo area.

2 Press the **Off centre** button in the Various field.

3 Check that the ship's symbol changes its position to where the cursor is located.

4 Press the **Mode 1** button in the Mode field, and then **Mode 2**.

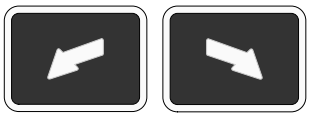
5 Observe that the ship symbol has been returned to the centre of the display.

6 ☐ Ok

Training

Observe this procedure to check the training function, as well as position and target track.

1 Press the **Train left** and **Train right** (arrow) buttons in the Train field repeatedly.



2 Check that the white audio line on the screen trains correspondingly. Try both directions.

3 Move the cursor to any position on the screen.

4 Press the **Position Track** button in the Train field.

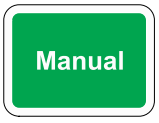
5 Check that a circle appears at the cursor, and that the audio line moves to the circle.

6 Move the cursor to an echo.

7 Press the **Target Track** button in the Train field.

8 Check that a violet circle appears at the cursor, and that the audio line moves to the circle.

9 Press the **Manual** button in the Train field.



10 Check that the violet circle disappears.

11 Press the **Auto Search** button in the Train field.

12 Check that the audio line starts a search within the displayed sector limits.

13 Press the **Manual** button to stop the search.

14 ☐ Ok

Operating Panel backlight

The background light in the Operating Panel can be adjusted on the **Display** menu.

1 Click the **Display** tab to open the **Display** menu.

2 Locate the **Panel backlight** button.

3 Click the right and left side of the button repeatedly.

4 Check that the intensity of the Operating Panel backlight can be adjusted accordingly.

5 ☐ Ok

Power off

Observe the following procedure to switch off the sonar for the remaining tests.

1 Click the **Horizontal** tab to open the **Horizontal** menu.

2 Locate the **TX Power** button.

3 Click the button to switch off transmit power.

4 Press the **Power** button on the Operating Panel for approximately three seconds to switch off the sonar.

5 Check that the green LED next to the button extinguish, and that the sonar picture changes for the power off sequence.

6 ☐ Ok

Starting up the Transceiver Unit

Observe this procedure to power up the Transceiver Unit for the first time.

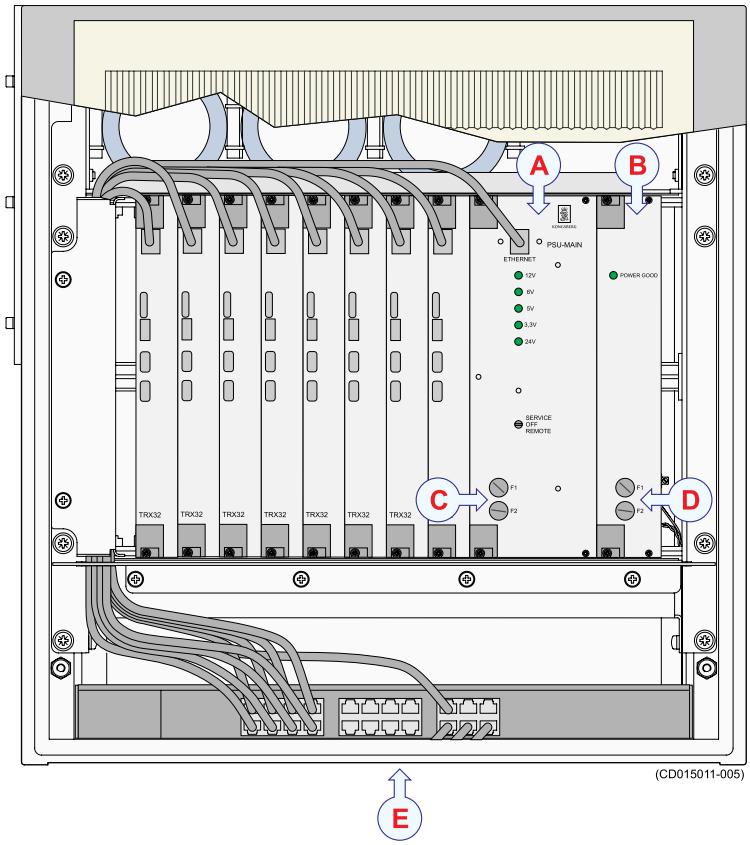
Figure 50 SX90 Transceiver Unit power supplies

A *Fuses F1 and F2 on the **PSU Main** power supply*

B *Service switch*

C *Indicator lamps for low voltage supplies*

D *Fuses F1 and F2 on the **High Voltage** power supply*



Procedure

1. Dismount the heat exchanger door from the Transceiver Unit.
2. Remove the fuses **F1** and **F2** from the **High Voltage** power supply front panel (D).

   Note

   The High Voltage power supply is the unit mounted on the far right side of the Transceiver Unit.

3. Check that the service switch **S1** (B) on the **PSU Main** power supply is in *OFF* (middle) position.
4. Connect the mains power cable to the mains connector at the bottom of the Transceiver Unit.

5 Check that the lamps marked **5V**, **3,3V** and **24V** (C) on the **PSU Main** power supply are lit.

6 Start up the Transceiver Unit by setting the service switch **S1** (B) to *SERVICE* position. Check that the fan starts up, and that the lamps marked **12V** and **6V** (C) on the **PSU Main** power supply are lit.

7 Switch off the Transceiver Unit by setting the service switch **S1** (B) to *REMOTE* position.

8 Start up the sonar in the wheelhouse by pressing the **Power** button on the Operating Panel for approximately two seconds.

9 Check that the Transceiver Unit starts up after approximately two minutes.

10 Switch off the sonar, and check that the Transceiver Unit is switched off as well.

Checking the hoist/lower system

The following set of procedures requires two persons:

- One person must be stationed on the bridge to operate the sonar.
- One person must stay in the sonar room to make sure the hoist/lower system works properly.

Proper communication must exist between the two locations.

Note

*Should any problems arise during the operation, the person in the sonar room must switch the motor protecting switch **S301** in the Motor Control Unit to OFF position.*

The two procedures must be performed simultaneously by the person on the bridge and the person in the sonar room:

- *Checking the bridge functions* shall be performed on the bridge.
- *Checking the sonar room functions* shall be performed in the sonar room.

To simplify the test, you may bring a copy of the applicable pages from this document down to the sonar room.

Topics

- *Preparations* on page 120
- *Select the hull unit to be used* on page 120
- *Checking the bridge functions* on page 121
- *Checking the sonar room functions* on page 123

Preparations

Prior to the two main test procedures, observe the following preparations.

Select the hull unit to be used

The Simrad SX90 can be provided with several different hull units.

Observe the following procedure to define which hull unit that is used on the sonar.

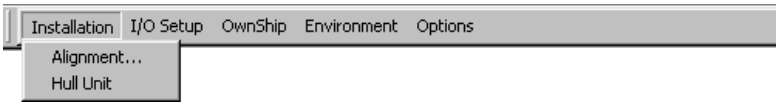
1 Open the **Setup** menu.

2 Click the **Test** button to open the **Test** menu.

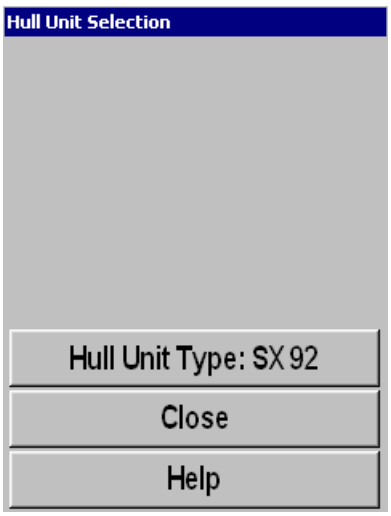
3 On the **Test** menu, click the **Installation menu** button to switch the menu on.

4 Observe that the installation menu opens across the top of the display presentation.

5 On the **Installation** menu, select **Installation →Hull Unit**.



6 Observe that the **Hull Unit Selection** parameter dialog opens in the bottom right corner.



7 Click the **Hull Unit Type** button, and select the correct hull unit from the list provided.

8 Click **Close** to save the information and exit.

9 On the **Test** menu, click the **Installation menu** button to switch the menu off.

Checking the bridge functions

Note

This procedure must be performed simultaneously with the next procedure; "Checking the sonar room functions".

The instructions marked [**Sonar room**] are performed in the sonar room.

1 Check that the depth under the keel is sufficient to safely lower the transducer.

2 Start the sonar.

- **a** Press and hold the **Power** button on the Operating Panel for approximately two seconds.
- **b** Check that the green LED next to the **Power** button starts blinking.
- **c** Observe that the sonar picture is displayed after approximately one minute.
- **d** Check that the green LED next to the **Up** button illuminates.
- **e** Check that the upper button in the **Status** menu shows *Transducer: UP*.
- **f** If communication exists, notify the sonar room to perform the next step.

3 [**Sonar room**] Set the motor protecting switch **S301** in the Motor Control Unit to *ON* by pressing the handle upwards.

4 [**Sonar room**] Set the hoist/lower switch **S302** in the Motor Control Unit to *REMOTE*.

5 Lower the transducer to its middle position.

- **a** Press the **Middle** button on the Operating Panel to move the transducer to its middle position.
- **b** Check that the LED next to the **Middle** button starts to flash, and that the audible signal indicates transducer movement.
- **c** When middle position has been reached, check that the LED next to the **Middle** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows *Transducer: MIDDLE*.

6 Lower the transducer to its lower position.

- **a** Press the **Down** button to lower the transducer to the lower position.
- **b** Check that the LED next to the **Down** button starts to flash, and that the audible signal indicates transducer movement.

c When lower position has been reached, check that the LED next to the **Down** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows *Transducer: DOWN*.

7 Hoist the transducer back up to its middle position.

a Press the **Middle** button on the Operating Panel to move the transducer to its middle position.

b Check that the LED next to the **Middle** button starts to flash, and that the audible signal indicates transducer movement.

c When middle position has been reached, check that the LED next to the **Middle** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows *Transducer: MIDDLE*.

8 Hoist the transducer back up to its upper position.

a Press the **Up** button on the Operating Panel to hoist the transducer to its upper position.

b Check that the LED next to the **Up** button starts to flash, and that the audible signal indicates transducer movement.

c When upper position has been reached, check that the LED next to the **Up** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows *Transducer: UP*.

9 Lower the transducer to its lower position.

a Press the **Middle** button on the Operating Panel to move the transducer to its middle position.

b Check that the LED next to the **Middle** button starts to flash, and that the audible signal indicates transducer movement.

c When middle position has been reached, check that the LED next to the **Middle** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows *Transducer: MIDDLE*.

10 Hoist the transducer back up to its upper position.

a Press the **Up** button on the Operating Panel to hoist the transducer to its upper position.

b Check that the LED next to the **Up** button starts to flash, and that the audible signal indicates transducer movement.

c When upper position has been reached, check that the LED next to the **Up** button illuminates continuously, that the audible signal stops, and that the upper button in the **Status** menu shows *Transducer: UP*.

11 Notify the sonar room to perform the next step.

12 [**Sonar room**] Set the hoist/lower switch **S302** in the Motor Control Unit to *STOP* position.

13 Switch off the sonar.

- **a** Press and hold the **Power** button on the Operating Panel for approximately three seconds.
- **b** Check if the green LED next to the button extinguish, and that the sonar picture is changed to present the power off sequence.

14 Notify the sonar room that the test is finished.

Checking the sonar room functions

Note

This procedure must be performed simultaneously with the procedure and checklist in the previous chapter; "Checking the bridge functions".

The instructions marked [**Bridge**] are performed on the bridge. Note that those procedures are more detailed that what is presented here.

1 Check that the depth under the keel is sufficient to safely lower the transducer.

2 [**Bridge**] Start the sonar.

3 Set the motor protecting switch **S301** in the Motor Control Unit to *ON* by pressing the operating handle upwards.

4 Set the hoist/lower switch **S302** in the Motor Control Unit to *REMOTE*.

5 [**Bridge**] Lower the transducer to its middle position.

6 [**Bridge**] Lower the transducer to its lower position.

7 [**Bridge**] Hoist the transducer back up to its middle position.

8 [**Bridge**] Hoist the transducer back up to its upper position.

9 [**Bridge**] Lower the transducer to its lower position.

10 [**Bridge**] Hoist the transducer back up to its upper position.

11 [**Bridge**] Notify the sonar room to perform the next step.

12 Set the hoist/lower switch **S302** in the Motor Control Unit to *STOP* position.

13 [**Bridge**] Switch off the sonar.

14 [**Bridge**] Notify the sonar room that the test is finished.

Perform self-noise test

This test procedure allows you to check the SX90's self-noise.

This procedure is done before the transducer cable is connected to the Transceiver Unit.

1 Start up the sonar.

2 Select the following parameters in the menu system to execute a self-noise test of the sonar installation.

a Open the **Setup** menu.

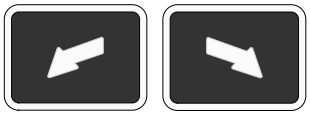
b Locate the **Test** button, and click it to open the **System Test** menu.

c Click the **Test Config** button to access the **Test Config** parameter dialog in the lower part of the menu field.

d Click **Noise & VR** to select the **Noise test** menu settings.

After the preparations described above has been carried out, the echo level for the selected audio beam will be displayed in the **Echo Level** button in the **System Test** menu.

3 If noise is shown on the display, use the **Train left** and **Train right** (arrow) buttons on the Operating Panel to turn the white audio line to the noisy area on the display.



4 Read the current echo level displayed by the **Echo Level** button.

If this does not help, check that other equipment on board, such as cooling systems (RSV), hydraulic pumps, electric motors etc, do not influence on the noise reading.

5 Write down the measured echo level here.

Echo level (dB):

6 Switch off the sonar.

Starting up the sonar system

To do the final tests, the vessel must be in the sea. This is because the transducer always must be in water before you start transmitting.

WARNING

If the sonar system starts transmitting while the transducer is in open air, this may lead to serious damage to the transducer and the transmitters.

The following set of procedures requires two persons:

- One person must be stationed on the bridge to operate the sonar.
- One person must stay in the sonar room to make sure the Transceiver Unit works properly.

Make sure that proper communication exists between the two locations.

Note

*Should problems occur in the sonar room, the person in the sonar room must set the service switch **S1** on the PSU Main power supply to "Off" (middle position).*

The following two procedures must be performed simultaneously by the person on the bridge and the person in the sonar room:

- *Actions on the bridge* shall be performed on the bridge.
- *Actions in the sonar room* shall be performed in the sonar room.

To simplify the test, you may bring a copy of the applicable pages from this manual down to the sonar room.

Preparations

In order to prepare the system start-up, carry out the following operations in the Transceiver Unit and the Motor Control Unit.

1 Connect and fasten the transducer plug to the left-hand side of the Transceiver Unit. Use the screws and washers applied for the protecting cover.

Note

To avoid unnecessary strain on the connectors, you must insert the transducer plug straight in. Tighten the fastening screws evenly and a little at a time, alternating between screws on opposite sides of the plug, until all the screws are adequately tightened.

2 Re-insert the fuses **F1** and **F2** on the **High Voltage** power supply.

Note

The High Voltage power supply is the unit mounted on the far right side of the Transceiver Unit.

3 Set the hoist/lower switch **S302** in the Motor Control Unit to *Remote* position.

Actions on the bridge

Note

This procedure must be performed simultaneously with the next procedure; "Actions in the sonar room".

The instructions marked [**Sonar room**] are performed in the sonar room.

1 Start up the sonar.

2 Check that the depth is sufficient for lowering of the transducer.

3 Press the **Middle** button on the Operating Panel to lower the transducer to its middle position.

4 Click the **Mode** button on the top of the menu system, and select mode *Bow up*.

5 Open the **Horizontal** menu, and locate the **TX Power** button.

6 Set the TX Power to *Low*, and check that echoes appear on the display.

7 Select a suitable range.

8 [**Sonar room**] Check that you can hear the sound of the transmit pulse from the transducer.

9 Set the TX Power to *Medium*, and check that echoes appear stronger.

10 [**Sonar room**] Check that the sound of the transmit pulse is stronger.

11 Set the TX Power to *Full*, and check that echoes appear even stronger.

12 [**Sonar room**] Check that the sound of the transmit pulse is even stronger.

Actions in the sonar room

Note

This procedure must be performed simultaneously with the procedure and checklist in the previous procedure; "Actions on the bridge".

The instructions marked [**Bridge**] are performed on the bridge. Note that those procedures are more detailed that what is presented here.

1 [**Bridge**] Start up the sonar.

2 [**Bridge**] Check that the depth is sufficient for lowering of the transducer.

3 [**Bridge**] Press the **Middle** button on the Operating Panel to lower the transducer to its middle position.

4 [**Bridge**] Click the **Mode** button on the top of the menu system, and select mode *Bow up*.

5 [**Bridge**] Open the **Horizontal** menu, and locate the **TX Power** button.

6 [**Bridge**] Set the TX Power to *Low*, and check that echoes appear on the display.

7 [**Bridge**] Select a suitable range.

8 Check that you can hear the sound of the transmit pulse from the transducer.

9 [**Bridge**] Set the TX Power to *Medium*, and check that echoes appear stronger.

10 Check that the sound of the transmit pulse is stronger.

11 [**Bridge**] Set the TX Power to *Full*, and check that echoes appear even stronger.

12 Check that the sound of the transmit pulse is even stronger.

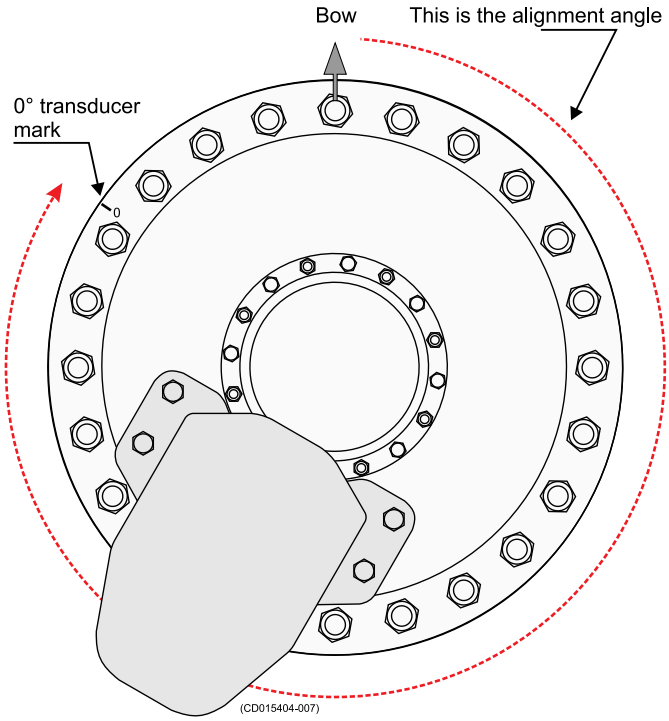
Alignment of the sonar picture

Independent of the hull unit orientation, the alignment is always defined as:

The angle measured clockwise from the bow to the 0 degrees transducer mark.

The 0 degrees transducer mark is located outermost on the mounting flange, and it is marked as a red “0”. Depending on the transducer mounting, it can be located at any angle on the mounting flange, not necessarily as shown in the illustration below.

Figure 51 Hull unit alignment



1 Locate the 0 degrees transducer mark.

2 Estimate the approximate alignment angle (0 to 360 degrees) clockwise from the bow to the 0 degrees transducer mark.

The angle between each mounting bolt can be used as an aid.

- On the 20 bolts standard version (SX92 and SX93 hull units), there are 15 degrees between each bolt.
- On the 24 bolts optional version (SX90 and SX91 hull units), there are 18 degrees between each bolt.

3 Turn the echo picture on the display in the following way:

a Open the **Setup** menu.

b Click the **Test** button to open the **System test** menu.

c Click the **Installation Menu** button, and observe that the menu appears on the top of the display.

d Select **Installation →Alignment**.

e Observe that the **Sonar transceiver configuration** parameter dialog appears at the bottom of the menu field.

f Click the **Alignment** button.

g Enter the estimated alignment angle.

4 Check that the echo picture on the display is correct in relation to the ambient situation.

If not, make a fine adjustment of the alignment.

5 In order to make a correct alignment, a particular target such as a buoy is required. When the alignment is correct, write down the angle here:

Alignment correction (degrees):

Adjusting the stabilisation sensor offset

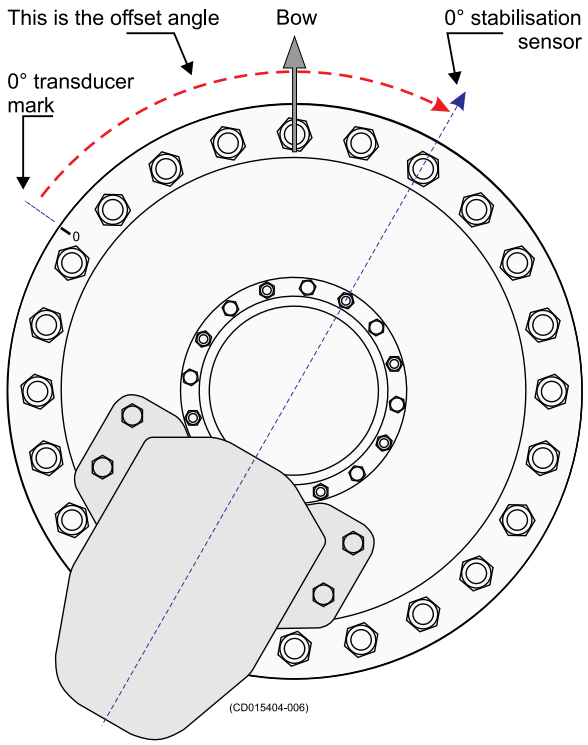
How to estimate the offset angle

Independent of the hull unit orientation, the offset of the stabilisation sensor is always defined as:

The angle measured clockwise from the 0 degrees transducer mark to the 0 degrees reference for the stabilisation sensor.

The 0 degrees transducer mark is located outermost on the mounting flange. The 0 degrees reference for the stabilisation sensor is always related to the gantry, as indicated below.

Figure 52 Offset angle definition



1. Locate the 0 degrees transducer mark.
2. Estimate the approximate offset angle (0 to 360 degrees) from the 0 degrees transducer mark to the 0 degrees reference stabilisation mark.

   The angle between each mounting bolt can be used as an aid.

   - On the 20 bolts standard version (SX92 and SX93 hull units), there are 15 degrees between each bolt.
   - On the 24 bolts optional version (SX90 and SX91 hull units), there are 18 degrees between each bolt.

3 Record the estimated offset angle. Write it down here:

Offset angle (degrees):

How to enter the stabilisation offset angle into the sonar

1 Open the **Setup** menu.

2 Click the **Test** button to open the **System test** menu.

3 Click the **Installation Menu** button, and observe the menu that appears on the top of the display.

4 Select **Installation →Installation →Alignment**.

5 Observe that the **Sonar transceiver configuration** parameter dialog appears at the bottom of the menu field.

6 Click the **Offset** button.

7 Enter the estimated offset angle.

Defining own ship parameters

In order to achieve accurate readings from the sonar system, certain vessel parameters must be entered.

Specify ship dimensions

To get the correct size of the vessel symbol on the display, the length and width must be adjusted in the following manner.

1 Open the **Setup** menu.

2 Click the **Test** button to open the **System test** menu.

3 Click the **Installation Menu** button, and observe the menu that appears on the top of the display.

4 Select **Installation →Own ship →Ship dimensions**.

5 Observe that the **Ship Dimensions** parameter dialog appears at the bottom of the menu field.

6 Click the **Ship Length** button, and enter the appropriate value.

7 Press the **Ship Width** button, and enter the appropriate value.

8 Click **Close** to finish.

When a new display mode is selected, the vessel symbol on the sonar screen will change to the defined size.

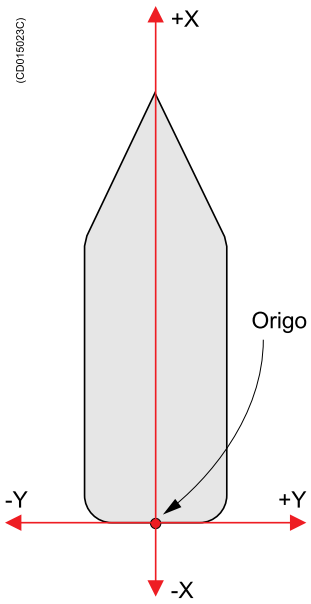
Specify instrument position offsets

In order to get correct references of the instruments, the position of the sonar transducer and the GPS antenna must be set relative to the origo definition.

The origo is initially positioned at the vessel's stern. This is necessary to get the **Own ship** and **Seine** markers positioned on the vessel's track line, which is generated from the vessel's stern.

Observe the following procedure for transducer and GPS antenna positioning.

Figure 53 Location of the vessel's origo



1 Open the **Setup** menu.

2 Click the **Test** button to open the **System test** menu.

3 Click the **Installation Menu** button, and observe the menu that appears on the top of the display.

4 Select **Installation →Own ship →Instrument position offsets →Transducer**.

5 Observe that the **Instrument Offset Positions** parameter dialog appears at the bottom of the menu field.

6 Click the **X Position** button and enter the correct value.

7 Click the **Y Position** button and enter the correct value.

8 Click **Close** to finish.

9 Select **Installation →Own ship →Instrument position offsets →GPS**.

10 Observe that the **Instrument Offset Positions** parameter dialog appears at the bottom of the menu field.

11 Click the **X Position** button and enter the correct value.

12 Click the **Y Position** button and enter the correct value.

13 Click **Close** to finish.

When a new display mode is selected, the instruments will change to the chosen positions.

INTERFACING PERIPHERAL EQUIPMENT

This chapter describes how the sonar system shall be set up to accept the signals from the sensors, and how you can verify that the various interfaces are fully functional. The chapter also describes how connect the sonar to other acoustic systems to allows for transmit synchronisation.

Topics

- *Interface and telegrams overview* on page 134
- *Interface settings* on page 137
- *Synchronisation with other acoustic systems* on page 143
- *Installation procedures* on page 146
- *Test procedures* on page 148
  - *Speed log interface test* on page 148
  - *Course gyro interface setup and test* on page 149
  - *Positioning system interface setup and test* on page 150
  - *Echo sounder system interface setup and test* on page 151
  - *Trawl system interface setup and test* on page 151
  - *Catch monitoring interface setup and test* on page 152
  - *Radio buoy system interface setup and test* on page 153
  - *Current meter interface setup and test* on page 153

Related topics

- *Processor Unit serial lines* on page 94

Interface and telegrams overview

The following tables summarize the input and output telegrams supported by the sonar, as well as the option on the **Installation** menu used to activate them.

- The **System** column identifies the choices on the **I/O Setup →Sensors** sub-menu.
- The **Sensor** column defines the various choices for each system.

Table 10 Telegrams received from external sensors

System	Sensor and Supported input telegrams
Trawl system	**ITI:** • *TPT Trawl position true vessel* on page 257 • *TPC Trawl position in cartesian coordinates* on page 256 • *GLL Trawl position* on page 251 • *DBS Depth of trawl below surface* on page 250 • *MTW Water temperature at the trawl* on page 253 • *HFB Trawl headrope to footrope and bottom* on page 251 • *TDS Trawl door spread* on page 255 • *TS2 Trawl spread 2* on page 257 • *TFI Trawl filling* on page 255 • *TTS Trawl to shoal distance* on page 257
	FS3300: • *FS3300 Binary depth* on page 251
Echo sounder	**Echo NMEA:** • *DBS Depth below surface* on page 243 • *DBT Depth below transducer* on page 243 • *DPT Depth* on page 244
Seine system	**ITI:** • *TPT Trawl position true vessel* on page 257 • *TPC Trawl position in cartesian coordinates* on page 256 • *GLL Trawl position* on page 251 • *DBS Depth of trawl below surface* on page 250 • *MTW Water temperature at the trawl* on page 253 • *HFB Trawl headrope to footrope and bottom* on page 251 • *TDS Trawl door spread* on page 255 • *TS2 Trawl spread 2* on page 257 • *TFI Trawl filling* on page 255 • *TTS Trawl to shoal distance* on page 257
	PI30: • *PSIMP-F PI Sensor definition* on page 253 • *PSIMP-D PI Sensor data* on page 254
Position system	**GPS:** • *GGA Global positioning system fix data* on page 244 • *GLL Geographical position latitude/longitude* on page 245 • *RMC Recommended minimum specific GNSS data* on page 247

Table 10 Telegrams received from external sensors (cont'd.)

System	Sensor and Supported input telegrams
Speed	**SpeedLog:** • *VBW Dual ground and water speed* on page 248 • *VTG Course over ground & ground speed* on page 249 • *RMC Recommended minimum specific GNSS data* on page 247 • *VHW Water speed and heading* on page 249
Heading	**Gyro:** • *HDT Heading, true* on page 246 • *HDM Heading, magnetic* on page 246 • *HDG Heading, deviation and variation* on page 245 • *VTG Course over ground & ground speed* on page 249 • *RMC Recommended minimum specific GNSS data* on page 247 • *VHW Water speed and heading* on page 249
Weather	**Wind:** • *MWD Wind direction and speed* on page 247 • *MWV Wind speed and angle* on page 247 • *VWR Relative (apparent) wind speed and angle* on page 249
Current data	**NMEA:** • *VDVCD Vector current direction* on page 258
	CIF: • *Furuno CIF* on page 258
Buoy System	**BuoyNMEA:** • *Serpe BSC Buoy input* on page 261 • *Ryokosei RBY Buoy input* on page 262
Only systems that support input telegrams from external sensors are listed. Remaining choices on the **Installation →I/O Setup** menu are for internal or special interfaces.	

Table 11 Telegrams sent to external devices

System	Supported output telegram
Trawl System	**ITI:** • *TPP Tracked target position or marker* on page 256
Target Output	**CM60:** • *MDS Measured data shoal* on page 252
Only systems that provide output telegrams are listed.	

Interface settings

This section defines the default interface settings provided at delivery. It also describes how to change these settings, and how to monitor the “traffic” on a chosen serial line.

Default interface settings

Upon delivery, the sensor interfaces are all preset to these recommended settings.

Table 12 Default interface settings

Sensor	Type	Port	Baudrate	Talker
Trawl system	ITI	5	4800	None
Trawl sonar	FS	5	4800	None
Echo sounder	NMEA	5	4800	None
Catch monitoring	PI30	5	4800	None
Positioning system	GPS	4	4800	None
Speed log	SpeedLog	2	4800	None
Heading sensor	Gyro	3	4800	None
Hull unit	—	—	—	—
Stabilisation sensor	—	—	—	—
Weather	Wind	5	4800	None

How to change the interface settings

To it becomes necessary to change any of the interface settings, observe the following procedures.

How to open the Installation menu

This procedure explains how to open the installation menu on the Processor Unit.

1 Open the **Setup** menu.

2 Click the **Test** button to open the **System Test** menu.

3 Click the **Installation Menu** button.

4 Observe that the **Installation** menu appears at the top of the display.

Figure 54 Installation menu

How to specify interface parameter settings using the Installation menu

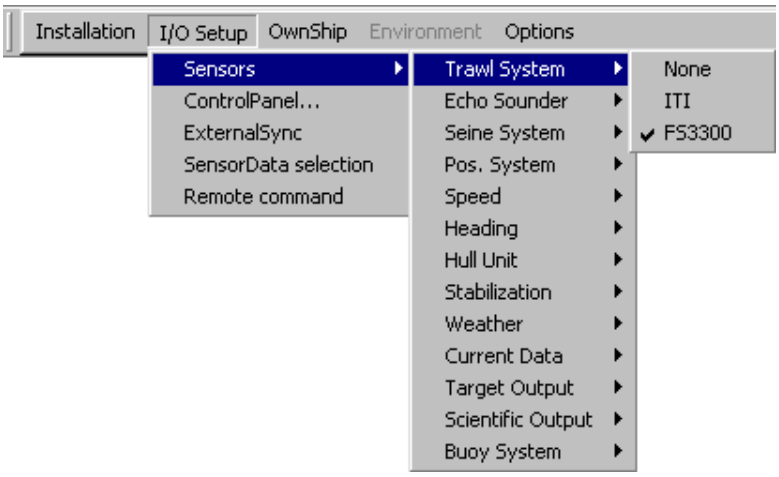
If you enter a wrong value and the sensor interface does not work, you can change the parameters settings as many times as you wish. The final settings you make are automatically saved when the sonar system is switched off.

1 Open the **Installation** menu.

2 Select **I/O Setup →Sensors**.

3 Observe the sub-menu listing all the available sensors.

Figure 55 IO Setup menu with Sensors sub-menu



4 Move the cursor down on the sub-menu, but do not press the **Select** button on the Operating Panel.

5 Observe that each sensor has a secondary sub-menu listing the default choices or *None*. The chosen setting is marked.

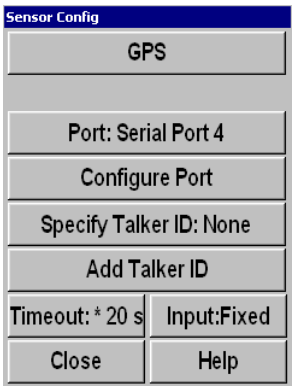
6 Click *None* if you wish to disable the sensor input.

7 Click any other settings if you wish to define the sensor's interface parameters.

8 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

9 Make the appropriate settings for the chosen sensor.

Figure 56 Sensor Configuration dialog



A Click the **Port** button to select input/output port for the selected interface

Note

*Do not select **Port 1**, it is used to communicate with the Operating Panel.*

*Do not select any of the **LAN** ports, as these are dedicated for other interfaces.*

B Click the **Configure Port** button to set up baud rate, parity and number of data bits.

C Click the **Specify Talker** button to specify a telegram talker identifier.

This is a useful feature if you have two sensors providing the same information to the sonar. You can then disable the input telegrams from one of these sensors by specifying a dedicated talker identifier.

D Click the **Add Talker ID** if the requested talker ID was not on the list under the **Specify Talker** button.

This feature allows you to add your own talker identification. An on-screen keyboard is automatically presented to accept the characters.

E Click the **Input** button to select how the sonar shall read the input ports.

- **Auto**: The sonar reads all available input ports to search for the telegrams provided by the sensor.
- **Fixed**: The sonar only reads the port specified by the **Port** button to search for the telegrams provided by the sensor.

F Click the **Timeout** button to adjust the time-out used when the system automatically selects input data.

This feature is used if more than one sensor connected to the sonar provides the same information. A typical example would be that both a gyro and a GPS is connected, and both provide heading information. The time-out defines how long the sonar will wait for data from one sensor until it reads data from the next sensor on the priority list. See also procedure *How to select which input telegrams to read*.

10 Click **Close** to finish.

How to select which input telegrams to read

This procedure explains how to select input telegrams from the following external sensors:

- Buoy
- Position
- Heading
- Speed
- Course

For each sensor input, you can choose **Auto**. This option will allow the sonar to search for all the telegram formats that are listed, and automatically give priority to certain sensors according to a built-in list. If you choose this option, the **Timeout** value selected in the **Sensor Configuration** parameter dialog specifies how long the sonar will wait for one telegram before it starts to search for the next.

1 Open the **Installation** menu.

2 Select **I/O Setup →Sensor Data Selection**.

3 Observe the parameter dialog.

Figure 57 Sensor Data Selection dialog

4 Click the **BuoyData** button to open the **Buoy Data** parameter dialog.

5 Click **Auto**, or if you wish to specify a dedicated telegram format, choose from the list provided.

The following telegram formats can be received:

- *Serpe BSC Buoy input* on page 261
- *Ryokosei RBY Buoy input* on page 262

6 Click the **Position** button to open the **Position** parameter dialog.

7 Click **Auto**, or if you wish to specify a dedicated telegram format, choose from the list provided.

The following telegram formats can be received:

- *GGA Global positioning system fix data* on page 244
- *GLL Geographical position latitude/longitude* on page 245
- *RMC Recommended minimum specific GNSS data* on page 247

8 Click the **Heading** button to open the **Heading** parameter dialog.

9 Click **Auto**, or if you wish to specify a dedicated telegram format, choose from the list provided.

The following telegram formats can be received:

- *HDT Heading, true* on page 246
- *HDM Heading, magnetic* on page 246
- *HDG Heading, deviation and variation* on page 245
- *VTG Course over ground & ground speed* on page 249
- *RMC Recommended minimum specific GNSS data* on page 247
- *VHW Water speed and heading* on page 249

10 Click the **Speed** button to open the **Speed** parameter dialog.

11 Click **Auto**, or if you wish to specify a dedicated telegram format, choose from the list provided.

The following telegram formats can be received:

- *VBW Dual ground and water speed* on page 248
- *VTG Course over ground & ground speed* on page 249
- *RMC Recommended minimum specific GNSS data* on page 247
- *VHW Water speed and heading* on page 249

12 Click the **Course** button to open the **Course** parameter dialog.

13 Click **Auto**, or if you wish to specify a dedicated telegram format, choose from the list provided.

The following telegram formats can be received:

- *VTG Course over ground & ground speed* on page 249
- *RMC Recommended minimum specific GNSS data* on page 247

How to monitor the traffic on a serial line

The Processor Unit software provides an **Object Inspector** utility. It allows you to monitor the data on a connected serial line.

The **Object Inspector** dialog will display the transmit and receive data currently handled by the selected communication port. If you click **Always on top**, you can make changes in the sonar's menu system without removing the **Object Inspector** dialog.

How to open the Object Inspector [sonar program] utility

This procedure explain how to open the sonar program's Object Inspector dialog on the Processor Unit.

1. Open the **Setup** menu.
2. Click the **Test** button to open the **System Test** menu.
3. Click the **Message Bar** button.
4. Observe that the **Message Bar** parameter dialog appears at the bottom of the menu field.
5. Select *Always on*.
6. Observe the appearance of a small horizontal bar at the bottom of the display. On the right hand side, a few buttons display the number of warnings, errors and alarms that are presently active.
7. Double-click on the message bar line using the **Object** button on the Operating Panel, or with right mouse button.
8. Observe that the Object Inspector dialog appears.

Checking communication lines with external sensors

The Object Inspector is an efficient tool to verify that a serial line is working, and to check the telegram format(s) of the received data.

This procedure explains how you can use the Object Inspector [sonar program] to check the communication lines between the sonar and its peripheral devices.

1. Open the Object Inspector utility.
2. Open **Simrad SX90 →SensorIOControl →HWPortManager** by clicking the + symbols.
3. Observe the list of communication ports.

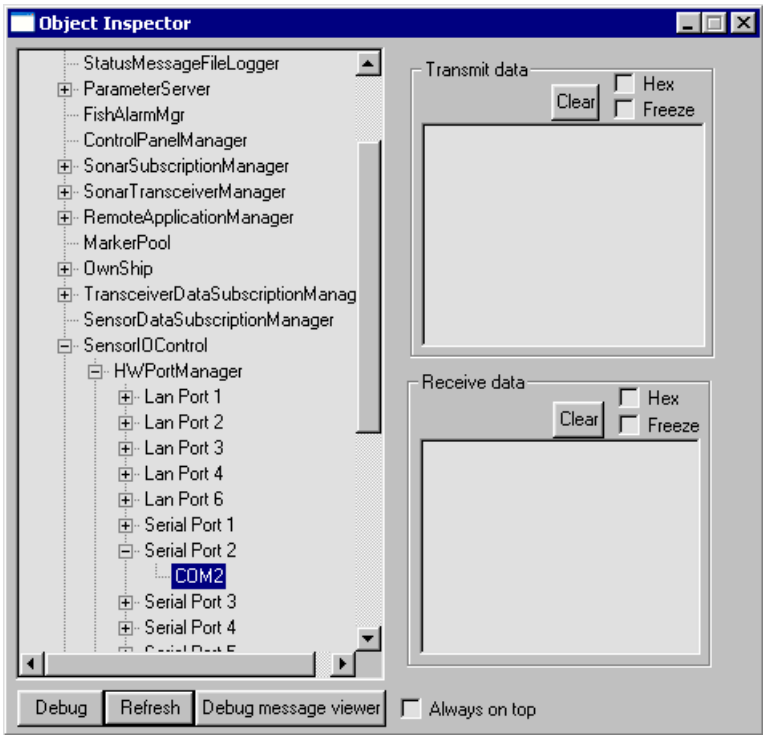
4 Click the + sign in front of the serial or Ethernet (LAN) port you wish to monitor.

Some interface ports are used by the sonar system. By default this is:

- Serial 1 is used to communicate with the Operating Panel.
- LAN 1 is used to communicate with the Motor Control Unit.

5 Click the COM symbol under the serial port, or the port number under the LAN port

Figure 58 Object Inspector dialog with Sensor I/O control shown



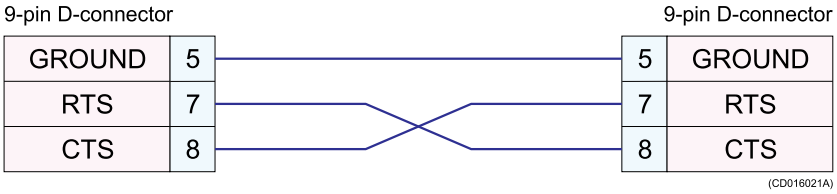
6 Observe the transmit and receive data on the right hand side of the dialog.

Synchronisation with other acoustic systems

About synchronisation

The synchronisation interface is based on a serial port.

Figure 59 External synchronisation cable to 9–pin D-connector using an RS-232 interface



The synchronisation uses the **CTS** and **RTS** connections of the RS–232 interface.

There are two synchronisation modes:

- The SX90 sonar can be interfaced as a *Slave* to an external *Master* synchronisation device. This external device may be an other sonar, echo sounder or even a dedicated synchronisation system.
- The SX90 sonar can be in *Master* mode controlling when the slave(s) can transmit.

SX90 set up as Slave

When the SX90 is set up as a *Slave*, the sonar must receive a trigger signal from the synchronisation unit each time the sonar shall be permitted to transmit. This trigger signal is interfaced to the sonar's serial port , where the **CTS** (Clear To Send) pin is used to give the operating system an **Event** message. The **Event** message is handled by the software, and it will (if previous ping has been finished) start the ping sequence.

As an acknowledge to the synchronisation from the *Master* unit, the SX90 will lower the **RTS** (Ready To Send) before transmitting. This indicates that the SX90 is "busy". Once the transmission and reception sequence ends, the SX90 will raise the **RTS** (Ready To Send) to indicate that it is ready for the next ping.

SX90 set up as Master

When set up as a *Master*, the SX90 can be set up to ignore *Slave* acknowledge. This is known as **Free running** mode.

- When in **Free running** mode, the *Master* pings as fast as possible, raising its **RTS** signal at start of ping and lower it at end of ping. The *Slave* will be triggered by the raised **RTS** signal as before.
- However, if not in **Free running** mode, the *Master* will wait for its **CTS** signal to be high ("ready to ping" acknowledge from the *Slave*) before it starts a new ping sequence.

The *Master* controls the **RTS** and receives acknowledge on the **CTS**.

The *Slave* is controlled by the **CTS** pin and sends acknowledge on the **RTS** pin. So the **RTS** on the *Master* side is connected to the **CTS** on the *Slave* side, and the **CTS** on the *Master* side is connected to the **RTS** on the *Slave* side.

Note

By default, the SX90 is set up for ***Wait for slave*** *mode.*

Synchronisation sequences

When connecting two systems based on this synchronisation concept, one set up as a *Master* and the other as a *Slave*, we have the following possible synchronisation sequences.

Figure 60 Synchronization timing: Master in "Free running" mode

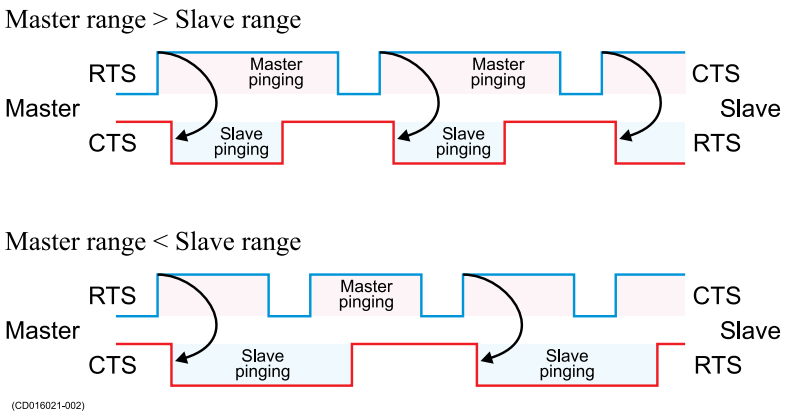
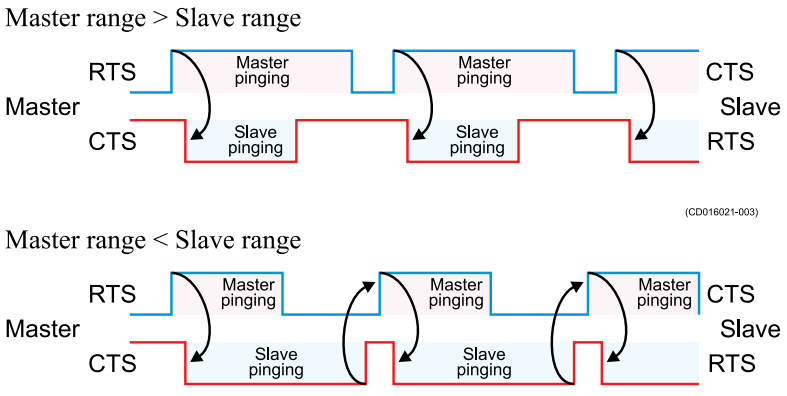


Figure 61 Synchronization timing: Master in "Wait for slave" mode



Trigger signals

If connected to an external synchronizing system, the **RTS** and **CTS** are both +5 V TTL signals, triggering on positive slope.

- **TrigIn**: CTS pin 8 on a 9-pin RS–232 plug (D-connector)
  - When the system is operating as **Master** in **Wait for slave** mode (or as a **Slave**) the system trigger on positive slope when the level exceeds +3 V.
- **TrigOut**: RTS pin 7 on a 9-pin RS–232 plug (D-connector)
  - This signal is lowered from +10 V to –10 V at the start of transmission, and returns to +10 V at the end of the transmission.

Installation procedures

This section describes how to connect a speed log and a course gyro to the sonar system.

Connecting the speed log

A speed log must be connected to the sonar. The cable must be provided by the installation shipyard. The sonar can read the speed information from the following three sources.

- Pulse log (200 pulses/nautical mile) (must be converted to a serial line format)
- Speed log with serial line output
- (D)GPS with serial line output

Note

The output from a pulse log must never be connected to more than one system simultaneously. If it is connected to the sonar, do not use the same output to feed other systems.

Related topics

- *Processor Unit serial lines* on page 94
- *Speed log interface test* on page 148
- *Moxa CP-134U-I serial adapter* on page 218

Pulse log (200 pulses/nautical mile)

The SX90 does not provide an input for a pulse log. In order to connect a speed log with pulse log, you will need a converter to match the serial line input on the Processor Unit.

Speed log with serial line output

The sonar can read the speed log data from a serial line with a standard NMEA 0183 telegram format. The telegram can contain both the speed and the course data.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

In order to perform the physical connection to the speed log, refer to the applicable log documentation.

(D)GPS serial line

The (D)GPS output data will normally contain the speed log information. In such case, this serial line can be used for both the position and speed data.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

In order to perform the physical connection to the GPS system, refer to the applicable system documentation.

Procedure

1 Connect the speed log as described.

2 Test the interface.

Connecting the course gyro

A course gyro must be connected to the sonar. The cable must be provided by the installation shipyard. The SX90 can read the course information from a serial line. In case where only a 3-phase synchro or stepper signal is available, an optional Gyro Interface Unit must be used for converting these signals to serial line format.

Related topics

- *Course gyro* on page 21
- *Course gyro interface setup and test* on page 149
- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Gyro with serial line output

The course data on the serial line must be on a standard NMEA 0183 telegram format. The telegram can contain both the speed and the course data.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

In order to perform the physical connection to the course gyro, refer to the applicable gyro documentation.

Gyro with 3-phase synchro or stepper output

If only a 3-phase synchro or stepper signal is available, an optional gyro interface unit must be used to convert these signals to serial line format. An **LR40 Digital Gyro Repeater** may be used for interfacing the following signals:

- 3-phase synchro signal, 20 to 115 V L-L, 50/60/400 Hz, gear ratio 1:360 or 1:180
- 3-phase stepper signal, 20 to 115 V L-L, gear ratio 1:360 or 1:180

LR40 Digital Gyro Repeater

The **LR40 Digital Gyro Repeater** can be provided by Simrad.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

For connections to the **LR40 Digital Gyro Repeater**, refer to the *LR40 Instruction Manual*.

Test procedures

Observe the individual test procedures for the various interfaces.

Speed log interface test

The speed log information can be provided by the sensor types described in section *Connecting the speed log* on page 146.

Refer to the selected speed log source in the following text.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Speed log (serial line interface)

Observe the following procedure to set up and test the speed log input.

1 Access the **I/O Setup** menu.
   - To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Speed →Speed Log**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line. Remember to set correct baud rate, and set **Talker** to *None*.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Check that the speed read-out in the **Status** parameter dialog corresponds to the reading from the vessel's speed log.

(D)GPS speed data (serial line interface)

If the GPS is used for the speed data input, wait with this test until the GPS position data are tested. When required, observe the following procedure to test the GPS speed input.

1 Access the **I/O Setup** menu.

- To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Speed →Speed Log**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line. Remember to set correct baud rate, and set **Talker** to *GP*.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Check that the speed read-out in the **Status** parameter dialog corresponds to the reading from the vessel's speed log.

Course gyro interface setup and test

The course gyro (heading) information can be provided by the sensor types described in section *Connecting the course gyro* on page 147.

Note

The heading information from a standard GPS receiver is generally too inconsistent to provide a stable sonar presentation.

Refer to the selected heading source in the following text.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Course gyro (serial line interface)

The Processor Unit can read the heading information from a serial line. If only a 3-phase synchro or stepper signal is available, an optional gyro interface unit must be used to convert these signals to serial line format.

Observe the following procedure to set up and test the course gyro input.

1 Access the **I/O Setup** menu.
   - To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Heading →Gyro**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Check that the heading read-out in the **Status** parameter dialog corresponds to the reading from the vessel's course gyro.

(D)GPS heading data (serial line interface)

If the GPS is used for the course gyro input, wait with this test until the GPS position data are tested. When required, use the following procedure for testing the GPS input.

1 Access the **I/O Setup** menu.
   - To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Heading →Gyro**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Check that the heading read-out in the **Status** parameter dialog corresponds to the GPS heading.

Positioning system interface setup and test

Observe the following procedure to set up and test the positioning system (GPS) input.

1 Access the **I/O Setup** menu.

- To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Pos.System →GPS**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Check that the latitude and longitude read-outs in the **Status** parameter dialog corresponds to the GPS read-out.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Echo sounder system interface setup and test

The Processor Unit can read the depth information from an echo sounder on standard NMEA 0183 serial line format. Observe the following procedure to set up and test the echo sounder interface.

1 Access the **I/O Setup** menu.

- To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Echosounder →EchoNmea**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Select *Bow up/Vertical* mode on the sonar.

7 Check that the depth read-out in the *Catch Data* page corresponds to the depth read-out on the echo sounder.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218

Trawl system interface setup and test

Observe the following procedure to set up and test the trawl system interface.

1 Access the **I/O Setup** menu.

- To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Trawl system**.
   - Select **→ITI** to check the interface to the Simrad ITI system
   - Select **→FS3300** to check the interface to the Simrad FS20/25 and FS70 systems.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Open the **Setup** menu on the sonar.

7 Click the **Gear** button to access the **Gear** parameter dialog at the bottom of the menu field.

8 Select either of the *Bottom Trawl* or *Pelagic Trawl* settings.

9 Click the **Edit** button to access the **Trawl Configuration** parameter dialog.

10 Check that the different results in the parameter dialog corresponds to those from the connected trawl system.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Catch monitoring interface setup and test

Observe the following procedure to set up and test the catch monitoring system interface.

1 Access the **I/O Setup** menu.
   - To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Trawl system**.
   - Select **→ITI** to check the interface to the Simrad ITI system
   - Select **→PI30** to check the interface to the Simrad PI30, PI32, PI44 or PI54 systems.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Open the **Setup** menu on the sonar.

7 Click the **Gear** button to access the **Gear** parameter dialog at the bottom of the menu field.

8 Select one of the *Purse* settings.

9 Click the **Edit** button to access the **Net Configuration** parameter dialog.

10 Check that the different read-outs in the parameter dialog corresponds to those from the connected catch monitoring system.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Radio buoy system interface setup and test

Observe the following procedure to set up and test the radio buoy system interface.

1 Access the **I/O Setup** menu.
   - To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →BuoySystem →Buoy NMEA**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Open the **Objects** menu, and check that the buoy read-out (F) is shown.

7 Select one of the buoys in the **Objects** menu, and verify that the buoy data is shown in the parameter dialog below the menu.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

Current meter interface setup and test

Observe the following procedure to set up and test the current meter system interface.

1 Access the **I/O Setup** menu.
   - To access this menu, see *How to change the interface settings* on page 137.

2 On the **I/O Setup** menu, select **Sensors →Current meter →Kaijo**.

3 Observe that the **Sensor Config** parameter dialog appears at the bottom of the menu field.

4 Change the settings in the **Sensor Config** parameter dialog to suit your requirements for the serial line.

5 Click **Close** to exit the **Sensor Config** parameter dialog.

6 Open the **Objects** menu, and check that the buoy read-out (F) is shown.

7 Select one of the buoys in the **Objects** menu, and verify that the buoy data is shown in the parameter dialog below the menu.

Related topics

- *Processor Unit serial lines* on page 94
- *Moxa CP-134U-I serial adapter* on page 218

FINAL TESTS AND MEASUREMENTS

In order to verify that the sonar works properly, the following measurements, tests and backup operations must be carried out:

- Source level measurements
- Receiving voltage response measurements
- Noise/speed curve
- Processor Unit backup and restore

To carry out these tests and measurements, an oscilloscope, a signal generator and a test hydrophone must be available.

Topics

- *Source level (SL) measurements* on page 155
- *Receiving voltage response (VR) measurements* on page 160
- *Noise/speed curve measurements* on page 163
- *Processor Unit backup and restore* on page 167

Source level (SL) measurements

This procedure calls for a test hydrophone. Prior to use, fill in the technical specifications and the appropriate environmental specifications for the hydrophone to be used. Use the table provided. Finally, you need to hook up the test equipment according to the schematics provided.

Preparations and test hydrophone data

1 Obtain the test equipment required.
   - **a** Test hydrophone
   - **b** Oscilloscope
   - **c** Signal generator
   - **d** Scientific calculator

2 Fill in the test hydrophone data.

Table 13 Test hydrophone data

Hydrophone data	Value	Unit	Example
Serial number		Serial no.	1823860
Date of calibration		month/year	10/96
Calibrated at temperature		°C	18°C
Sensitivity as transmitter S		dB//1 µPa/V	117
Sensitivity as receiver M		dB//1 µPa/V	–209,5
Attenuation extension cable (0,7/10 m)		dB	0
M total = M+M extension		dB//1 µPa/V	–209,5

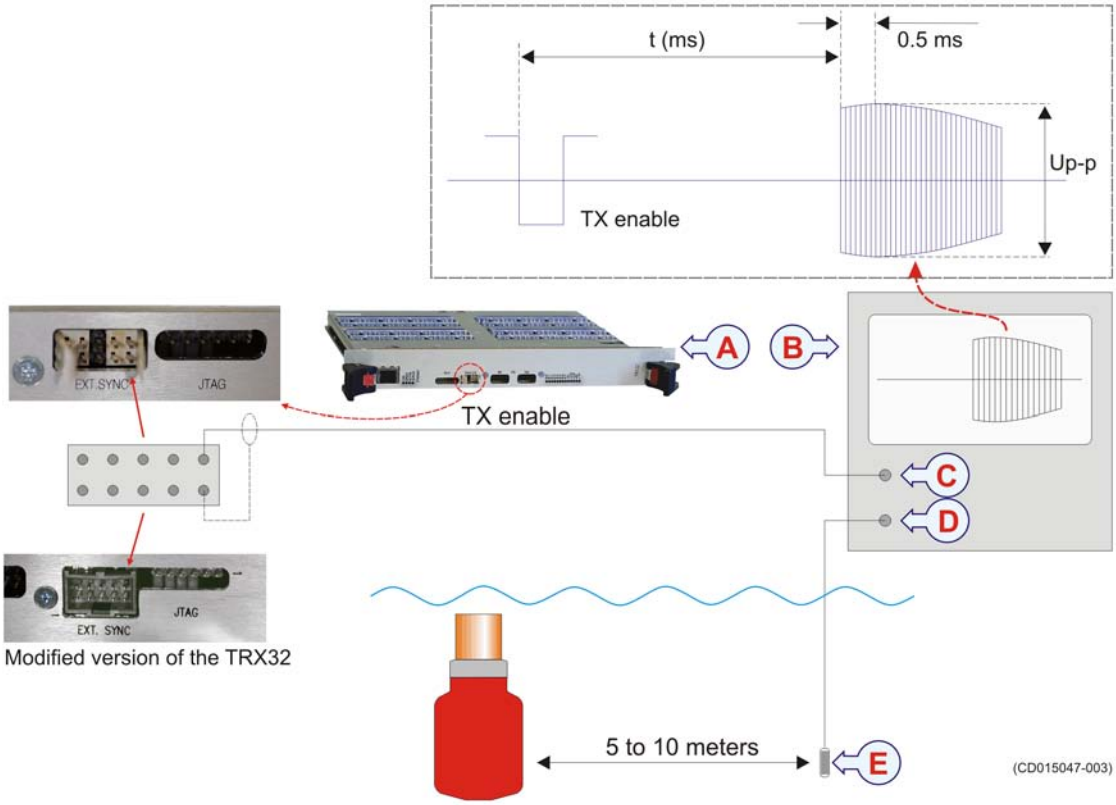
3 Lower the test hydrophone into the water, and adjust the depth so that it matches the transducer.

4 Connect the test equipment according to the schematics provided.

See *Test setup* on page 156.

Test setup

Figure 62 Test setup for source level (SL) measurement



A *Use EXT.SYNC connector on TRX32 board no.8 (far right)*

B *Oscilloscope*

C *Trigger input*

D *Hydrophone input*

E *Hydrophone*

Sonar parameters

For measurement of the source level in omni mode, use the following menu settings. This command sequence will automatically set up all the sonar parameters required to do the source level measurements.

1 In the **Setup** menu, click the **Test** button to access up the **System Test** menu.

2 Click the **Test Config** button.

Observe that the **Test Config** parameter dialog opens at the bottom part of the menu field.

3 Select *Source Level*, and click **Close**.

4 Open the **Horizontal menu** menu.

1 Set **Beam** to *Normal*

2 Set **Noise Filter** to *Off*

3 Set **Range** to *150 meters*

4 Set **Frequency** to *26 kHz*

5 Open the **Setup** menu.

1 Set **Stabilizer** to *Off*

Test procedure

Observe the following procedure to make the source level measurements.

1 Connect the hydrophone and **TX Enable** pulse to the oscilloscope as shown in the test setup.

→ *Test setup* on page 156

2 Ensure that the distance between the transducer and the hydrophone is between 5 and 10 meters depending on the size of your vessel.

3 Use a weight to keep the hydrophone in a stable vertical position.

4 Lower the hydrophone and adjust the tilt on the sonar to get maximum voltage on the oscilloscope at a tilt angle of approximately 0 degrees.

5 Measure the **time delay** from the negative going **TX Enable** pulse to the transmitter pulse on the oscilloscope.

Enter the result into the *SL Measurements results* table, row **A**.

6 Calculate the distance from the hydrophone to sonar transducer, and the total signal loss caused by of this range.

Enter the results into the *SL Measurements results* table, row **B**.

- Range (m) = Measured time delay (in msec) multiplied with 1,5
- Loss (dB) = 20 log R (range)

7 Read the oscilloscope measurements, and use the manual training controls on the Operating Panel to obtain maximum possible hydrophone voltage.

8 Read and calculate the hydrophone voltage, and enter the results into the *SL Measurements results* table, row **C**.

9 Enter the general information into the *SL Measurements results* table, row **D**.

- bearing angle
- tilt angle
- depth below keel
- water temperature

10 Enter the **U Hydr** value from the *SL Measurements results* table into the *Source Level (SL)* table, row **A**.

11 Fill in the **M total** from the *Test hydrophone data* table into the *Source Level (SL)* table, row **B**.

→ *Preparations and test hydrophone data* on page 155

12 Enter the **20 log R** value from the *SL Measurements results* table into the *Source Level (SL)* table, row **C**.

13 Perform the source level calculations as detailed in the table (header row), enter the result into row **D**, and compare the result with the specifications for the sonar.

Source level specification

- **Omni**: 215 ± 3 dB//1 µPa at 26 kHz

Finalizing the procedure

The source level measurements have now been completed.

Note

Do not remove the hydrophone from the position used for the source level measurements. This known position will be used for the receiving voltage response (VR) measurements in the next section.

Source level test results

The tables created for the test results are provided below.

Table 14 SL Measurements results

Measurements/calculations			Value	Unit	Example
A	Measured time delay			msec	3.33
B	Distance from hydrophone to transducer	R = 1,5 * t		meter	5.0
		20logR		dB	14
C	Hydrophone voltage in Omni	U(p-p)		volt	1.00
		U(rms) = U(p-p) / 2 / √2		volt	0,354
		U Hydr = 20 log U(rms)		dB//1V	-91
D	General information	Bearing (° stb/port)		°	-91
		Tilt angle		°	-2
		Depth below keel		meter	3
		Water temperature		°C	18

Table 15 Source level (SL)

SL = U Hydr - M + 20 log R		Value	Unit	Example
A	U Hydrophone		dB//1V	-9.0
B	M total		dB//1V/µPa	-209.5
C	20 log R		dB	14
D	SL Omni		dB//µPa	214.5

Receiving voltage response (VR) measurements

In order to measure the receiving voltage response, use the test hydrophone in the same position as for the previous source level measurements.

Note

If this test is done in shallow waters, or with other ships or harbour structures in the near vicinity, you may find it difficult to achieve correct readings. This is because the signals from the hydrophone are reflected from the seabed and the neighbouring surfaces.

Preparations

Use the same test setup as for source level measurements.

→ *Test setup* on page 156

1 The following test equipment is used.

- **a** Test hydrophone

  Observe the test hydrophone data collected during the source level test.

  → *Preparations and test hydrophone data* on page 155
- **b** Oscilloscope
- **c** Signal generator
- **d** Scientific calculator

Sonar parameters

For measurement of the receiving voltage response, use the following menu settings. This command sequence will automatically set up all the sonar parameters required to do the source level measurements.

1 Click the **Test Config** button.

Observe that the **Test Config** parameter dialog opens at the bottom part of the menu field.

2 Select *Noise & VR*, and click **Close**.

3 Open the **Horizontal menu** menu.

- **1** Set **Gain** to *30*
- **2** Set **Range** to *2000 meters*
- **3** Set **Noise filter** to *Off*
- **4** Set **TX Power** to *Off*

4 Open the **Display** menu.

- **1** Set **Display Gain** to *5*

5 Open the **Setup** menu.

6 In the **Setup** menu, click the **Test** button to access up the **System Test** menu.

1 Set **Interpolation** to *Off*

Test procedure

Observe the following procedure to measure the receiving voltage response. Note that the procedure calls for an oscilloscope and a test oscillator.

1 Check that the bearing and tilt angle values are the same as for the source level measurements.

2 Observe the **Echo Level** read-out in the **System Test**menu.

This is the echo level which - without a signal oscillator connected - is the noise level for the selected bearing. The current value is shown on the **Echo level** button.

3 Enter the **Echo Level** value (noise level) into the *VR Measurement results* table, row **A**.

4 Connect a signal oscillator to the hydrophone.

5 Adjust the oscillator frequency to 26.0 kHz.

6 Connect the oscilloscope channel to measure the output voltage to the hydrophone.

7 Adjust the oscillator output voltage to **1 Vpp**.

8 Enter the measured hydrophone voltage **U(p-p)** into the *VR Measurement results* table, row **B**.

9 Calculate the **U (rms) U Hydr** voltages in the *VR Measurement results* table, row **B**.

10 Retrieve the **Sensitivity as transmitter S** value from the *Test hydrophone data* table.

→ *Preparations and test hydrophone data* on page 155

Enter the information into the *Receiving voltage response (VR)* table, row **A**.

11 Retrieve the **U Hydr** value from the *VR Measurements results* table, and enter it into the *Receiving voltage response (VR)* table, row **B**.

12 Retrieve the **20 log R** value from the *SL Measurements results* table

→ *Source level test results* on page 159

Enter it into the *Receiving voltage response (VR)* table, row **C**.

13 Adjust the audio channel on the sonar to obtain the strongest echo.

Read the resulting result from the **Echo level** button on the **System Test** menu, and enter it into the *Receiving voltage response (VR)* table, row **D**.

14 Calculate the voltage response with the formula given in the header row in the *Receiving voltage response (VR)* table.

Compare the result with the specification.

Typical voltage response measurement

- 5 ± 3 dB

Finalizing the procedure

The voltage response measurements have now been completed.

Note

Remember to restore all menu settings to normal operational standard.

Receiving voltage response test results

The two tables created for the test results are provided below.

Table 16 VR Measurement results

Measurements/calculations			Value	Unit	Example
A	Noise level (Echo Level)			dB//1V/µPa	42
B	Hydrophone voltage	U(p-p)		volt	1
		U(rms) = U(p-p) / 2 / √2		volt	0.355
		U Hydr = 20 log U(rms)		dB//1V	-9

Table 17 Receiving voltage response (VR)

VR = – (S + U Hydr -20 log R) + EL		Value	Unit	Example
A	S = S Hydrophone		dB//µPa/V	117
B	U Hydrophone = 20*log U (rms) dB//1V		dB//1V	–9
C	20 log R		dB	16
D	Noise level (Echo Level)		dB//1V/µPa	90
E	VR (Voltage Response)		dB	–1

Noise/speed curve measurements

This section explains how to create a noise/speed curve for the sonar installation.

- *Preparations* on page 163
- *Test procedure* on page 163
- *Problems with flow noise* on page 164
- *Noise/speed test results* on page 164

Preparations

In order to make a noise/speed curve for the ship, make the following settings in the sonar menu.

1. Open the **Setup** menu.
2. Click the **Test** button to access up the **System Test** menu.
3. Click the **Test Config** button.
4. Observe that the **Test Config** parameter dialog opens at the bottom part of the menu field.
5. Select *Noise & VR* to select the menu settings for the receiving voltage response.
6. Click **Close**.
7. Open the **Horizontal** menu, click the **TX Power** button, and switch power off.
8. Observe that the **Echo level** button in the **System test** menu provides a read-out of the current value measured by the sonar.

Test procedure

This noise/speed curve can give a picture of the ship's best search speed. Observe the following procedure to make the curve.

1. Start with 0 knots with the engine running.
2. Use the two **Train right** and **Train left** buttons (arrows) on the Operator Panel to turn the audio line to the different bearings shown in the *Noise measurements* table.

   → *Noise/speed test results* on page 164
3. For every new bearing, wait at least 10 seconds before you make a read-out of the new echo level.
4. Enter the results into the table.
5. Increase the speed to 2 knots.
6. Repeat the readings for the six different bearings.
7. Repeat the procedure with the different speeds and bearings shown in the table.

8 When the measurements are finished, make a plot of the noise for 0 degrees bearing into the *Noise speed plot* diagram.

→ *Noise/speed test results* on page 164

Problems with flow noise

In case of very high ship noise levels, the RCG function will automatically regulate the receiver gain down. This lower gain will then cause a reduction in the receiving range.

To find out if this high noise level is caused by flow noise from the vessel's hull or by the engine/propeller, perform the following test.

By comparing these three resulting plots it should be possible to sort out if the main noise is caused by flow noise or engine/propeller noise. If the main noise is caused by flow noise, the ship's hull should be thoroughly inspected during next docking. If the noise is caused by the engine propeller, ensure that the propeller is not chipped or corroded.

1 Enter the noise level for 0 degrees bearing from the *Noise measurements table* into the column for *Stable speed* in the *Noise verification* table.

2 From 0 knots, give full engine thrust, and make a read-out of the noise level for acceleration when the vessel reaches each of the listed speeds. Enter the results into the table.

3 From full speed, reduce the engine thrust for minimum speed, and record similar results for retardation.

4 Make a dashed line plot of the acceleration noise into the *Noise/speed* plot, and a dotted line for the retardation noise.

Noise/speed test results

The tables and plot created for the test results are provided below.

Noise measurements results

Table 18 Noise measurements

	Bearing					
Speed	**—120°**	**—60°**	**0°**	**+60°**	**+120°**	**+180°**
0 knots						
2 knots						
4 knots						
6 knots						
8 knots						
10 knots						
12 knots						
14 knots						
16 knots						

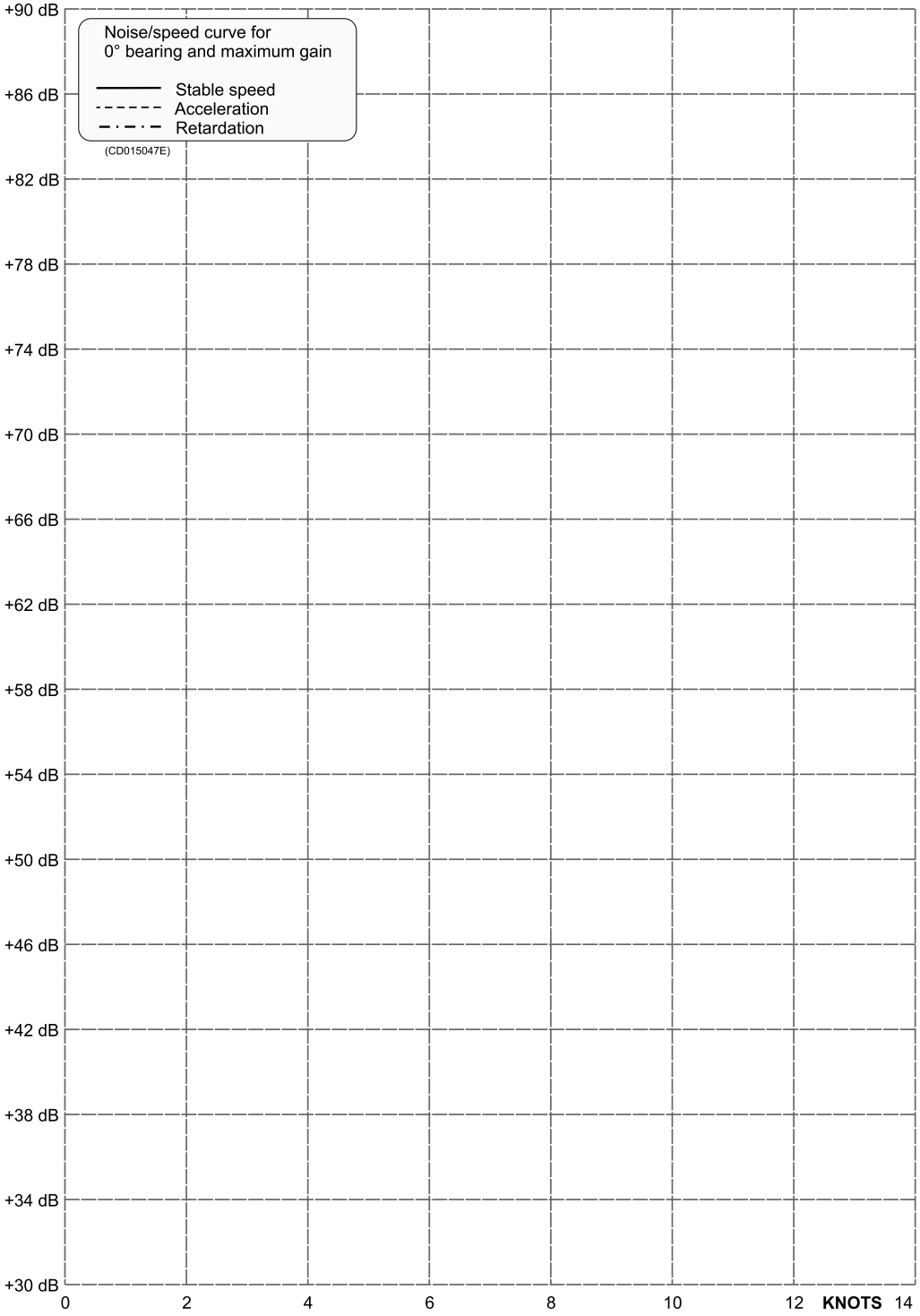
Noise verification results

Table 19 Noise verification

	Bearing is 0° for all measurements		
Speed	**Stable speed**	**Acceleration**	**Retardation**
0 knots			
2 knots			
4 knots			
6 knots			
8 knots			
10 knots			
12 knots			
14 knots			
16 knots			

Noise/Speed plot results

Table 20 Noise/Speed plot



Processor Unit backup and restore

When the sonar has installation has been finalized, all the settings have been made, and all the tests have been run, you must create a software backup with all the software on the Processor Unit.

Note

The procedures provided here assume that you have a keyboard and a mouse available, and that you are familiar with computers and the Windows operating system.

Topics

- *How to create a backup image using the 'Norton Ghost 8' utility* on page 167
- *How to restore from a backup image using the 'Norton Ghost 8' utility* on page 168
- *How to reactivate the Windows license* on page 169
- *How to create a bootable USB memory stick* on page 174

How to create a backup image using the 'Norton Ghost 8' utility

This procedure is used when you wish to create a backup containing your entire SX90 Processor Unit. The application used to do the backup is **Norton Ghost 8**. This application is provided on a bootable USB memory device.

To create the backup image, you need the bootable USB memory device provided with the SX90.

1 Boot the computer from the USB memory device.

This procedure describes how to start up SX90 Processor Unit from a bootable USB memory device, and how the **Norton Ghost 8** utility starts automatically.

1 Connect a computer keyboard to one of the USB connectors on the computer.

2 Insert the bootable memory device (USB memory stick).

3 Power up the Processor Unit with the front mounted on/off button (behind the lid).

4 As soon as the BIOS starts to load, press **F8** to choose boot device.

5 When the boot device selection dialog opens, choose the USB memory stick

It is normally identified as `USB: [name of memory stick]`

6 Allow the computer to boot.

7 Observe that the **Norton Ghost 8** utility starts automatically.

8 Click **Ok** in the **Norton Ghost 8** start-up dialog.

2 Click **Local →Disk →To image**.

3 Choose the local source drive. This is the disk partition to be copied to the backup disk.

Click **2** to select the largest partition. The small partition is the USB memory device.

4 Click **Ok**.

5 Choose which folder on the USB memory stick to hold the data.

If you use the factory USB memory device, folder **Backup** has been prepared for this use.

6 Enter preferred name for the image file.

7 Click **Save**.

8 In the next dialog, click **High** to use maximum file compression.

9 In the next dialog, click **Yes** to proceed with the image file creation.

10 Wait for the backup process to finish. Once completed, remove the USB memory stick, and restart the computer.

How to restore from a backup image using the 'Norton Ghost 8' utility

This procedure is used when you wish to restore the SX90 software from a pre-made backup file containing your entire installation. The backup file may either be generic, or it may be custom made to fit your system. The application used to restore from the backup is **Norton Ghost 8**.

If you restore your system from a generic image file, you must both change the Windows license, and activate it, before you can use the SX90. You must also reinstall the SX90 software.

1 Boot the computer from the USB memory device.

This procedure describes how to start up SX90 Processor Unit from a bootable USB memory device, and how the **Norton Ghost 8** utility starts automatically.

1 Connect a computer keyboard to one of the USB connectors on the computer.

2 Insert the bootable memory device (USB memory stick).

3 Power up the Processor Unit with the front mounted on/off button (behind the lid).

4 As soon as the BIOS starts to load, press **F8** to choose boot device.

5 When the boot device selection dialog opens, choose the USB memory stick

It is normally identified as `USB: [name of memory stick]`

6 Allow the computer to boot.

7 Observe that the **Norton Ghost 8** utility starts automatically.

8 Click **Ok** in the **Norton Ghost 8** start-up dialog.

2 Click **Local →Disk →From image**.

3 Choose from which folder on the USB memory stick to restore the data.

If you use the factory USB memory device, folder **Backup** has been prepared for this use.

4 Choose the backup file to restore.

5 Choose to which drive you wish to restore the data.

Use **Drive 2**. This is the largest drive.

6 Click **Ok** to verify the drive details.

7 Click **Yes** to proceed with the restore.

8 Wait for the restore process to finish. This will take some time depending on the size of the data.

9 Click **Reset computer** when the restore has finished.

10 Allow Windows to boot.

11 Click **Yes** when the computer wishes to restart.

12 When the computer has restarted, proceed with normal operation.

How to reactivate the Windows license

This procedure assumes that you have restored your Processor Unit from a generic operating system backup. Using this method, the Windows license on the Processor Unit is wrong, and it is not activated. Since an inactivated license only will work for a short period of time, it is very important that it is activated. Windows provides a dedicated utility (wizard) to do this.

> You must activate Windows within 30 days of installation. Activation helps verify that Windows on your computer is genuine and that it hasn't been used on more computers than the Microsoft Software License Terms allow. In this way, activation helps prevent software counterfeiting. You

> can activate either online or by phone. To activate online, you'll need an Internet connection. Activating by phone requires interacting with an automated phone system.
>
> — *http://windows.microsoft.com*

Note

This procedure is only valid for Windows XP.

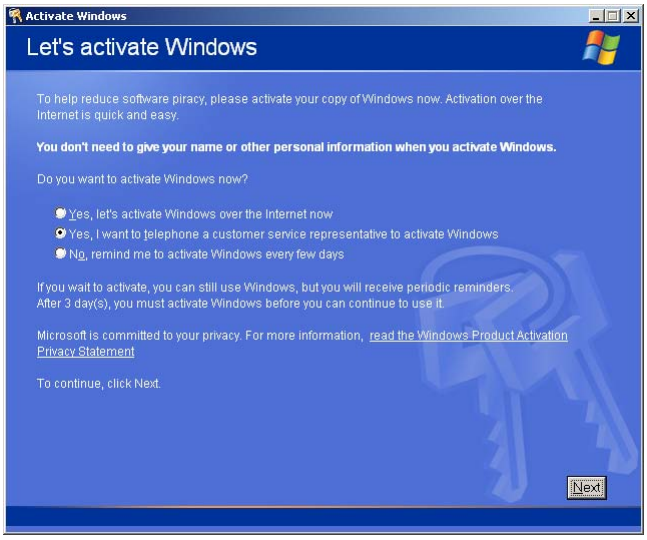
1 Connect a computer keyboard to one of the USB connectors on the computer.

2 Allow the computer to restart with the new operating system.

3 Answer **Yes** to reactivate Windows.

If the system fails to ask, you can start the activation wizard by clicking **Run** in the bottom left corner, and choose **Activate Windows** from the menu.

4 Observe the following dialog:


Activate Windows
Let's activate Windows
To help reduce software piracy, please activate your copy of Windows now. Activation over the Internet is quick and easy.
You don't need to give your name or other personal information when you activate Windows.
Do you want to activate Windows now?
Yes, let's activate Windows over the Internet now
Yes, I want to telephone a customer service representative to activate Windows
No, remind me to activate Windows every few days
If you wait to activate, you can still use Windows, but you will receive periodic reminders. After 3 day(s), you must activate Windows before you can continue to use it.
Microsoft is committed to your privacy. For more information, read the Windows Product Activation Privacy Statement
To continue, click Next.
Next

5 Click **Yes, I want to telephone a customer service representative...**.

6 Click **Next**.

7 Observe the following dialog:

Activate Windows
Activate Windows by phone
Just four steps, and you're done...
Step 1:
Select your location
Step 2:
Call a number below to speak with a customer service representative:
Toll-free number:
Toll number:
Step 3:
Provide the customer service representative with the following installation ID:
181566-675500-279052-545715-207804-329611-188796-165982-949684
(Click Change product key only if requested to do so by the customer service representative)
Step 4:
Type the confirmation ID that the customer service representative gave you:
A B C D E F G
To continue, click Next.
Back
Change Product key
Remind Me Later
Next

8 Click **Change Product key**.

9 Observe the following dialog:

Activate Windows
Change product key
If you need to change your product key, please enter it in the fields provided below, and then click Update. If not, click Telephone to return to the previous activation page.
The 25-digit product key can be found on the Certificate of Authenticity (COA) label attached to your computer or Windows documentation. It should look similar to the following example.
New key:
Please contact your computer manufacturer if you are unable to locate you COA label.
Telephone
Remind Me Later
Update

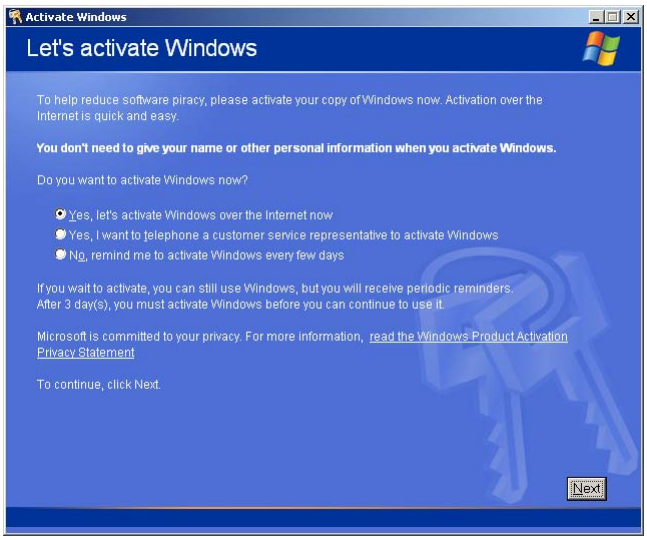
10 Enter the license code

The license is found on a sticker on the rear side of the lid covering the DVD player.

11 Click **Update**.

12 Click **Back**.

13 Observe the following dialog:


Activate Windows
Let's activate Windows
To help reduce software piracy, please activate your copy of Windows now. Activation over the Internet is quick and easy.
You don't need to give your name or other personal information when you activate Windows.
Do you want to activate Windows now?
Yes, let's activate Windows over the Internet now
Yes, I want to telephone a customer service representative to activate Windows
No, remind me to activate Windows every few days
If you wait to activate, you can still use Windows, but you will receive periodic reminders. After 3 day(s), you must activate Windows before you can continue to use it.
Microsoft is committed to your privacy. For more information, read the Windows Product Activation Privacy Statement
To continue, click Next.
Next

14 If your computer is connected to the Internet.

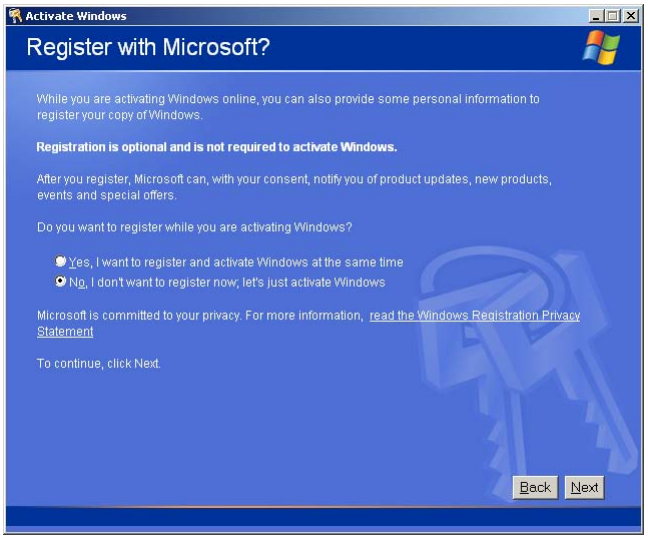
Note

Do not leave the computer connected to the Internet for longer than absolutely required. It is neither protected by anti virus applications nor firewall.

1 Click **Yes, let's activate Windows over the Internet now**.

2 Click **Next**.

3 Observe the following dialog:


Activate Windows
Register with Microsoft?
While you are activating Windows online, you can also provide some personal information to register your copy of Windows.
Registration is optional and is not required to activate Windows.
After you register, Microsoft can, with your consent, notify you of product updates, new products, events and special offers.
Do you want to register while you are activating Windows?
Yes, I want to register and activate Windows at the same time
No, I don't want to register now; let's just activate Windows
Microsoft is committed to your privacy. For more information, read the Windows Registration Privacy Statement
To continue, click Next.
Back
Next

4 Click **No, I don't want to register now...**.

5 Click **Next**.

6 Observe the following dialog:

15 If your computer is not connected to the Internet.

1 Click **Yes, I want to telephone a customer service representative...**.

2 Click **Next**.

3 Observe the following dialog:

Activate Windows
Activate Windows by phone
Just four steps, and you're done...
Step 1: Select your location
Step 2: Call a number below to speak with a customer service representative:
Toll-free number:
Toll number:
Step 3: Provide the customer service representative with the following installation ID:
181566-675500-279052-545715-207804-329611-188796-165982-949684
(Click Change product key only if requested to do so by the customer service representative)
Step 4: Type the confirmation ID that the customer service representative gave you:
A B C D E F G
To continue, click Next.
Back
Change Product key
Remind Me Later
Next

4 Select your location.

5 Call the number provided.

6 Provide the installation ID to the service desk.

7 Type in the confirmation ID provided to you.

8 Click **Next**.

9 Observe the following dialog:

16 When activation succeeds, click **OK**, and allow the computer to restart.

How to create a bootable USB memory stick

This procedure explains how to create a bootable USB memory device to use for backup purposes.

The following software is required:

- Microsoft DOS7
- Hewlett Packard USB Memory stick utility
- Norton Ghost 8

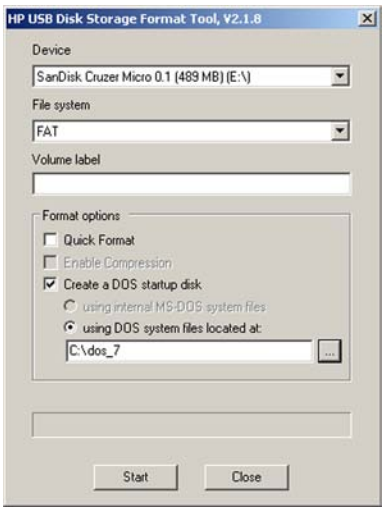
These software utilities are all available on the USB memory device that is provided with the sonar.

1 Make sure that you have all the necessary software on your computer.

The files comprising DOS7 must be placed in a separate folder.

2 Insert the USB memory device you wish to format.

3 Start the Windows version of the HP utility (hpusbfw.exe)



4 Observe that the USB memory device is recognized by the utility.

5 Set “File system” to FAT or FAT32.

6 Enter a “Volume label".

7 Click to “Create a DOS startup disk”

8 Identify the folder on your harddisk that contains the DOS7 files

9 Click **Start**.

10 Wait for the formatting process to finish. This will take some time depending on the size of the USB memory device.

11 Copy all the DOS 7 files from the folder on your hard disk to the root directory on the USB memory device.

12 Verify that the “autoexec.bat” file is present in the root folder of the USB memory device.

13 Modify the “autoexec.bat” file as required.

Use “Notepad” or a similar ASCII editor. The last line in the batchfile must contain the line “ghost.exe”.

14 Copy over the **Norton Ghost 8** application (ghost.exe) to the root folder of the USB memory device.

15 The USB device is now formatted as a boot drive, and it is prepared to be used for backup purposes.

16 Close down all the utilities you have used, and remove the USB memory device from the computer.

TECHNICAL SPECIFICATIONS

This chapter provides the technical specifications and requirements related to the Simrad SX90.

In Simrad, we are continuously working to improve the quality and performance of our products. Technical specifications may therefore be changed without prior notice.

Topics

- *Power specifications* on page 176
- *Weights and outline dimensions* on page 177
- *Environmental specifications* on page 179
- *Performance specifications* on page 180

Power specifications

This section provides the technical specifications and requirements related to the AC mains supply.

Display Unit

- Not applicable. Refer to the documentation provided by the manufacturer.

Processor Unit

- **Voltage requirement:** 115/230 Vac / 47–63 Hz / single phase, selectable (nominal)
- **Deviation:** 15%
- **Transient:** 20% of nominal voltage, recovery time 3 s
- **Power consumption:** Approximately 150 VA

Operating Panel

- Not applicable. This unit is not powered by AC mains.

Operating Panel power supply

- **Voltage**:
  - **Nominal**: 115/230 Vac single phase, automatic selectable
  - **Deviation**: 15% of nominal voltage
  - **Transient**: 20% of nominal voltage, recovery time 3 s
- **Power consumption**: 20 VA
- **Frequency**: 47 → 63 Hz

Transceiver Unit

- **Voltage**
  - **Nominal**: 230 Vac single phase
  - **Deviation**: 15% of nominal voltage
  - **Transient**: 20% of nominal voltage, recovery time 3 s
- **Power consumption**: 600 VA
- **Frequency**: 47 → 63 Hz

Audio amplifier with loudspeakers

- Not applicable. Refer to the documentation provided by the manufacturer.

Hull Unit

- **Voltage**
  - **Nominal**: 230/380/440 Vac 3–phase, selectable
  - **Deviation**: 15% of nominal voltage
  - **Deviation , 380/440 Vac**: 340 → 485 Vac
  - **Transient**: 20% of nominal voltage, recovery time 3 s
- **Power consumption**: 3000 VA
- **Frequency**: 47 → 63 Hz

Weights and outline dimensions

This section provides the technical specifications and requirements related to weight and outline dimensions. For more detailed information about the dimensions, refer to *Drawing file* on page 182.

Note

All weights are approximate.

Display Unit

- Not applicable. Refer to the documentation provided by the manufacturer.

Processor Unit

- **Weight:** 20 kg
- **Width:** 445 mm
- **Height:** 185 mm
- **Depth:** 365 mm
- **Outline dimensions:**
  - *Processor Unit dimensions* on page 186

Operating Panel

- **Weight**: 4 kg
- **Width**: 385 mm
- **Height**: 51 mm
- **Depth**: 165 mm
- **Outline dimensions**:
  - *Operating Panel dimensions* on page 187

Transceiver Unit

- **Weight**: 75 kg
- **Width**: 605 mm
- **Height**: 750 mm with shock absorbers
- **Depth**: 665 mm with shock absorbers and Heat Exchanger
- **Outline dimensions**:
  - *Transceiver Unit dimensions* on page 183

Audio amplifier with loudspeakers

- Not applicable. Refer to the documentation provided by the manufacturer.

Hull Unit

- **Weight**:
  - **SX90**: 850 kg
  - **SX91**: 900 kg
  - **SX92**: 850 kg
  - **SX93**: 900 kg
- **Outline dimensions**:
  - *SX90 Hull unit dimensions* on page 188
  - *SX91 Hull unit dimensions* on page 189
  - *SX92 Hull unit dimensions* on page 190
  - *SX93 Hull unit dimensions* on page 191

Installation trunk

- **Weight**: 335 kg
- **Outline dimensions**:
  - *SX90/SX91 Mounting trunk outline dimensions* on page 196
  - *SX92/SX93 Mounting trunk outline dimensions* on page 197
- **Production drawings**:
  - *SX90/SX91 Mounting trunk drawing* on page 192
  - *SX92/SX93 Mounting trunk drawing* on page 194
  - *SX90/SX91 Blind cover drawing* on page 198
  - *SX92/SX93 Blind cover drawing* on page 199

Environmental specifications

This section provides the technical specifications and requirements related to the environmental conditions.

Display Unit

- Not applicable. Refer to the documentation provided by the manufacturer.

Processor Unit

- **Operational temperature**: 0 → +50°C
- **Storage temperature**: -40 → +70°C
- **Humidity, non-condensing**: 5 → 95%

Operating Panel

- **Operational temperature**: 0 → +50°C
- **Storage temperature**: -40 → +70°C
- **Humidity, non-condensing**: 5 → 95%

Operating Panel power supply

- **Operational temperature**: 0 → +50°C
- **Storage temperature**: -40 → +70°C
- **Humidity, non-condensing**: 5 → 95%

Transceiver Unit

- **Operational temperature**: 0 → +50°C
- **Storage temperature**: -40 → +70°C
- **Humidity, non-condensing**: 5 → 95%

Audio amplifier with loudspeakers

- Not applicable. Refer to the documentation provided by the manufacturer.

Hull Unit

- **Operational temperature**: 0 → +50°C
- **Storage temperature**: -20 → +40°C
- **Humidity, non-condensing**: 5 → 95%

Performance specifications

This section provides the performance specifications for the Simrad SX90.

Operational frequency

- **Variable**: 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 and 30 kHz

Operational range

- **Range steps**: 150 → 4500 meters in 12 steps

  8000 meters range is optional.

Tilt and tip functionality

- **Tilt**: +10 → -60° in 1° steps
- **Tip**: +10 → -90°

Transmitter

- **Number of transmitter channels**: 256
- **Transmission modes**:
  - 360° omnidirectional
  - 180° vertical
- **Pulse modes**:
  - CW (Continuous Wave)
  - FM (Hyperbolic Frequency Modulation)

Receiver

- **Number of receiver channels**: 256
- **Digital filters**:
  - TVG (Time Varied Gain)
  - AGC (Automatic Gain Control)
  - RCG (Receiver Controlled Gain)
  - Ping-to-Ping Filter
  - Noise filter
  - FM Correlation filter

Hull Unit

- **Stroke length**
  - **SX92**: 1,2 m[1]
  - **SX93**: 1,6 m
  - **SX95**: 1,0 m
- **Maximum speed**
  - **SX92**: 24 kn
  - **SX93**: 20 kn
  - **SX95**: 12 kn

Echo presentations

- **Number of colours**: 16 or 64
- **Display resolution**: 1280 x 1024 pixels
- **Colours**: Weak, Normal or Strong
- **Palettes**: Choice of colour palettes to fit ambient light conditions

Transducer

- **Shape**: Cylindrical
- **Number of individual elements**: 256

Beams

- **Horizontal transmission**: 360°
- **Horizontal reception**: 8,5 → 13°
- **Vertical transmission**: 7,0 → 10,5°
- **Vertical reception**: 7,4 → 11,4°

Beamwidth

- **User selected**: Narrow, Normal or Wide

Stabilisation

- **Roll stabilisation**: Automatic, ±20°
- **Pitch stabilisation**: Automatic, ±20°

Interface

- Four serial lines (RS-232/RS-422/RS-485)
- RAW data output for scientific research (Ethernet) [*Optional*]
- Scientific output (Ethernet) [*Optional*]
- Transceiver Unit interface (Ethernet)

1. The SX92 is the standard hull unit provided with the SX90.

DRAWING FILE

This chapter contains relevant drawings related to the installation of the Simrad SX90.

Note

The mechanical drawings are for information and guidance only. They are not in scale. All dimensions are in mm unless otherwise is noted. The original installation drawings are available on PDF and/or AutoCad's DWG format. Visit www.simrad.com to download.

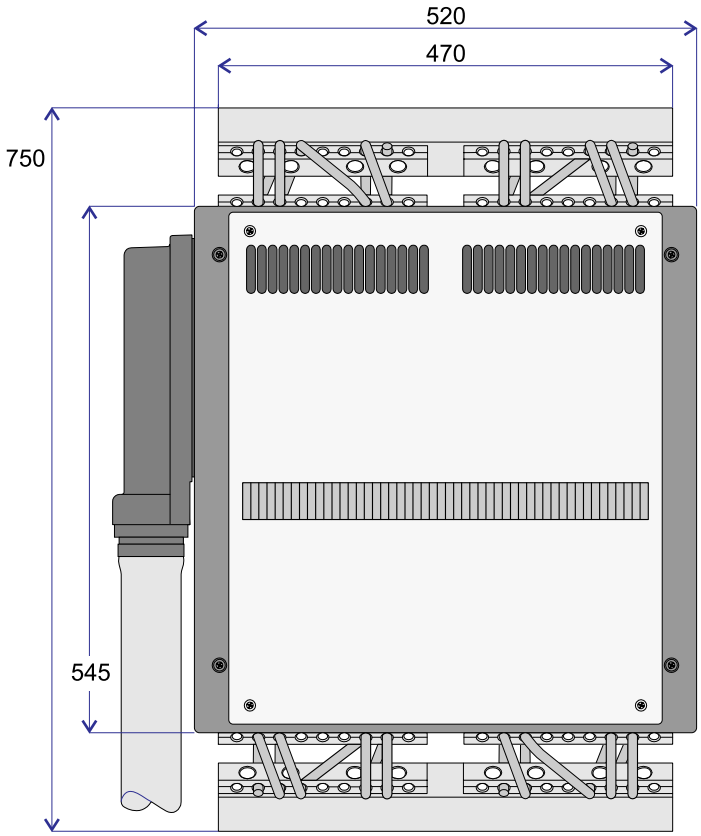
Cabinet outline dimension drawings

- *Transceiver Unit dimensions* on page 183
- *Processor Unit dimensions* on page 186
- *Operating Panel dimensions* on page 187

Hull unit outline dimension drawings

- *SX90 Hull unit dimensions* on page 188
- *SX91 Hull unit dimensions* on page 189
- *SX92 Hull unit dimensions* on page 190
- *SX93 Hull unit dimensions* on page 191
- *SX90/SX91 Mounting trunk drawing* on page 192
- *SX92/SX93 Mounting trunk drawing* on page 194
- *SX90/SX91 Mounting trunk outline dimensions* on page 196
- *SX92/SX93 Mounting trunk outline dimensions* on page 197
- *SX90/SX91 Blind cover drawing* on page 198
- *SX92/SX93 Blind cover drawing* on page 199

Transceiver Unit dimensions



All measurements in mm.
The drawing is not in scale

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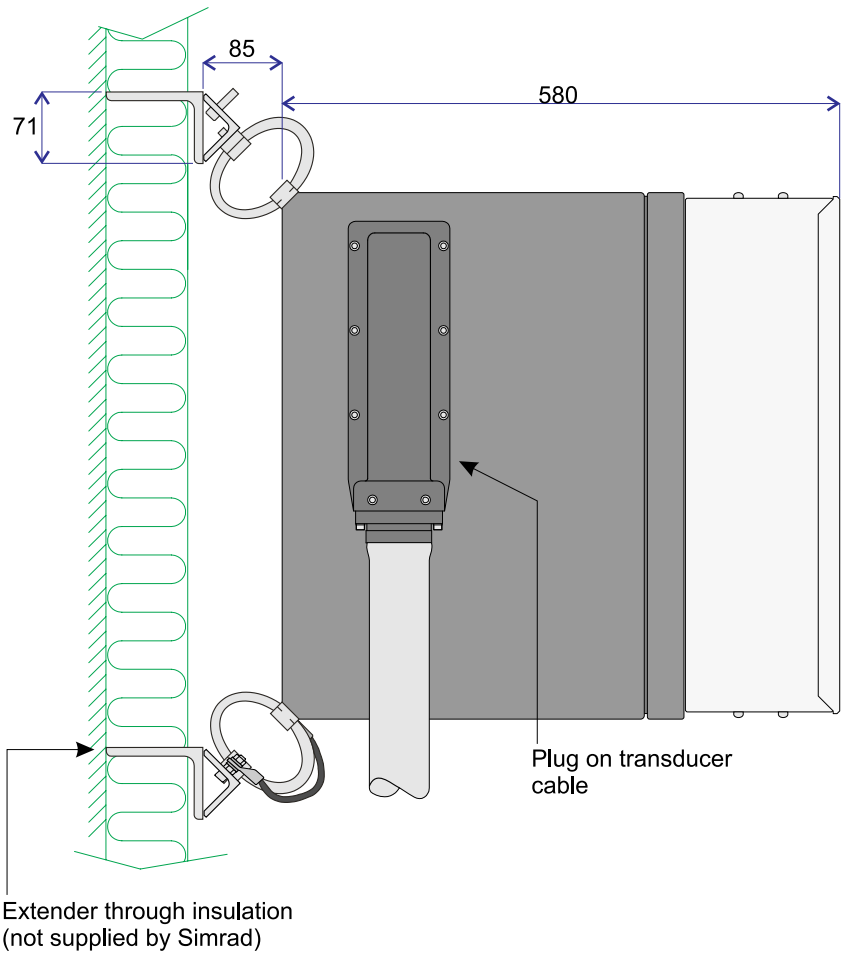

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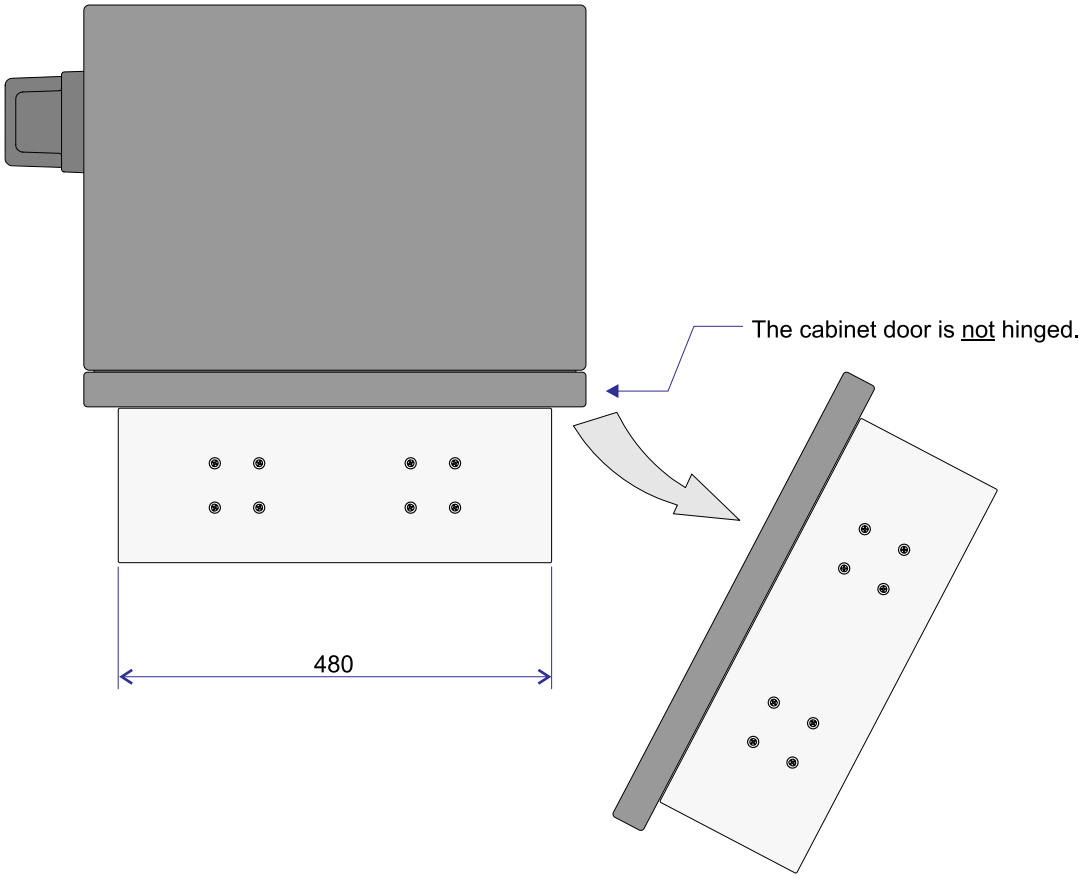

All measurements in mm.
The drawing is not in scale

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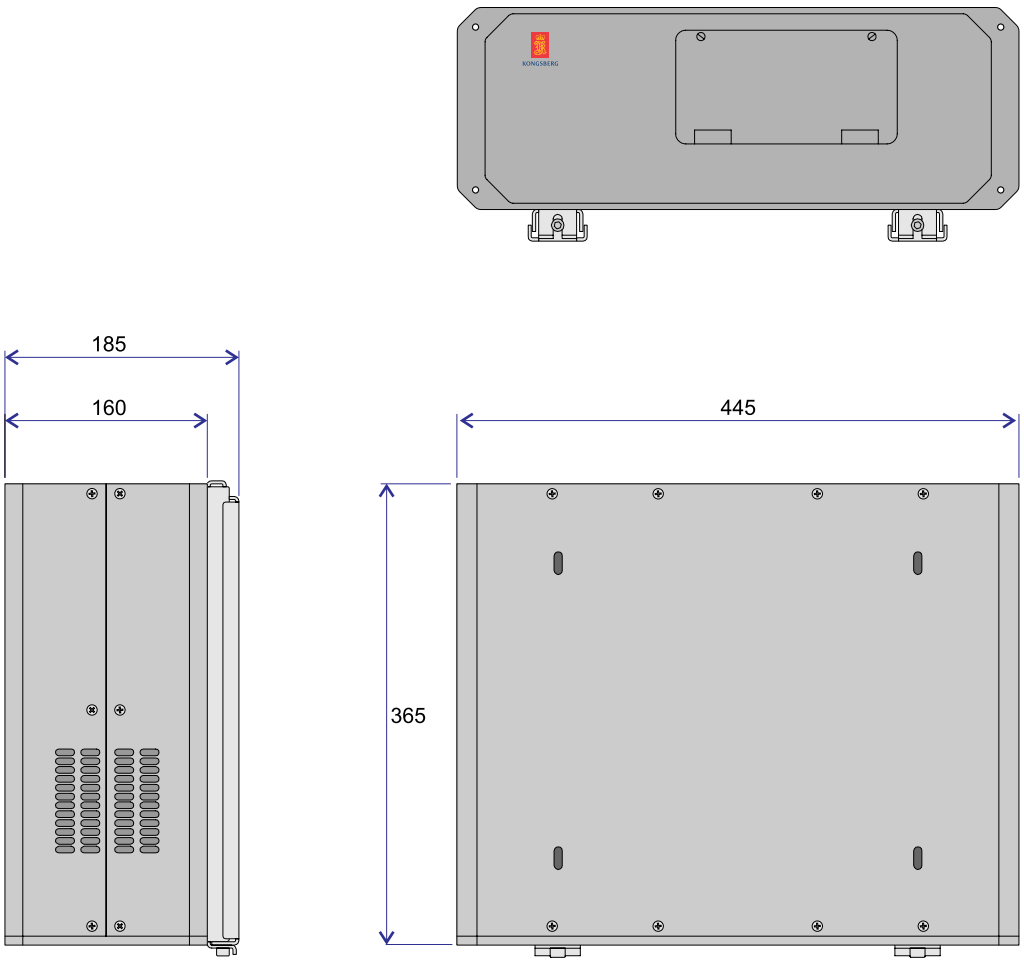
Processor Unit dimensions



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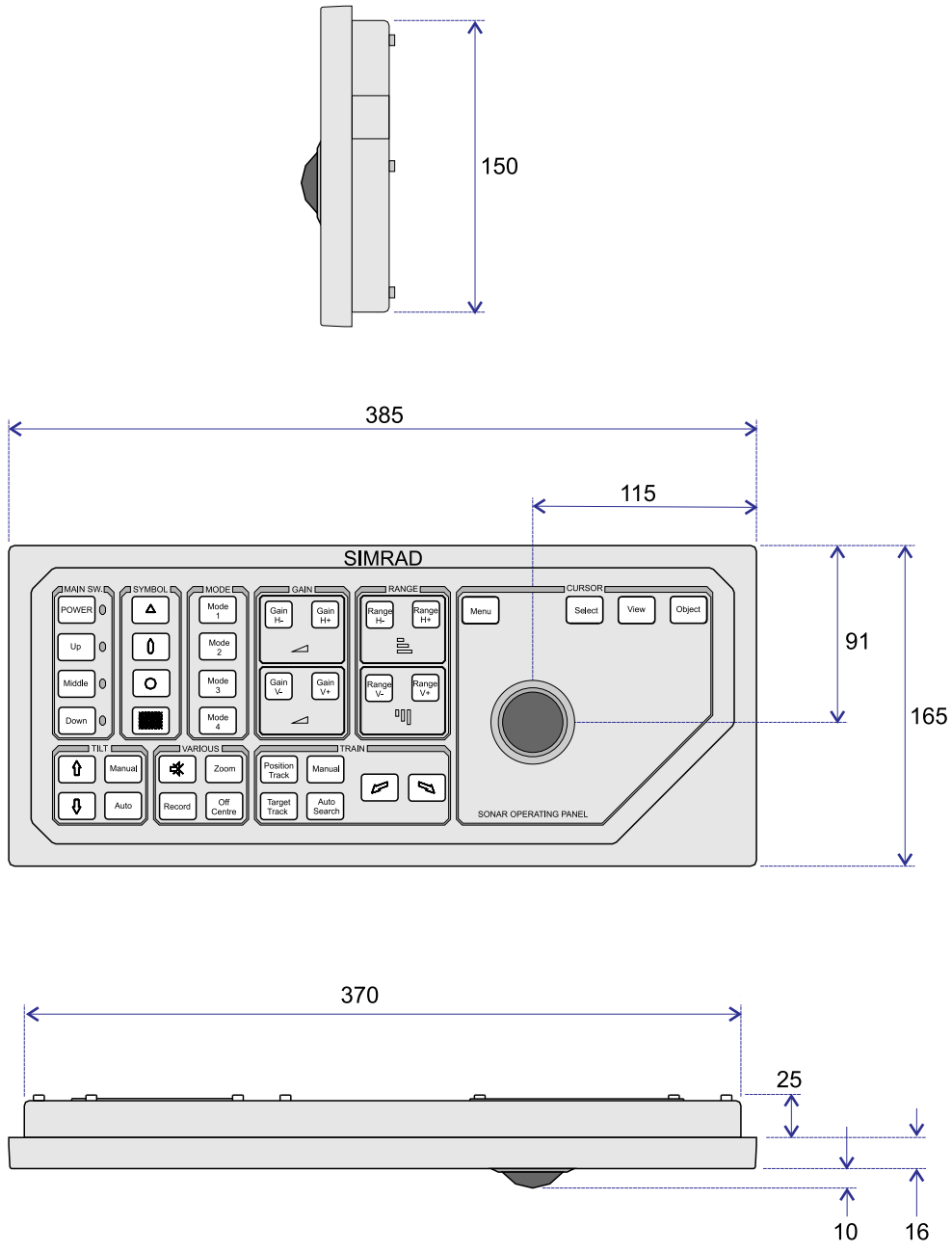
Operating Panel dimensions



Note:
All measurements are in mm.
The drawing is not in scale.

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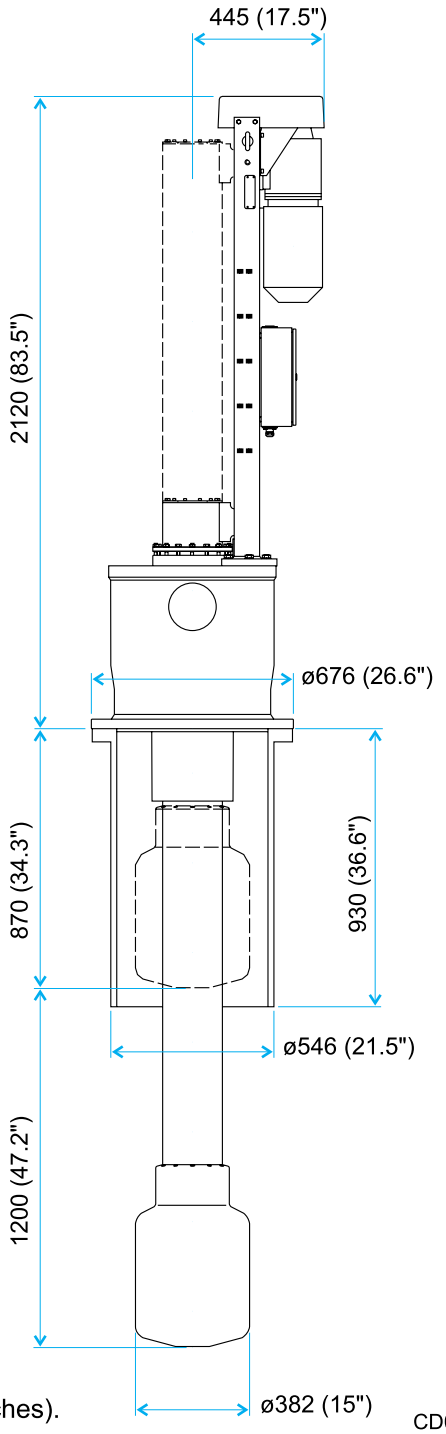
SX90 Hull unit dimensions



Note:
All measurements are in mm (and inches).
The drawing is not in scale.

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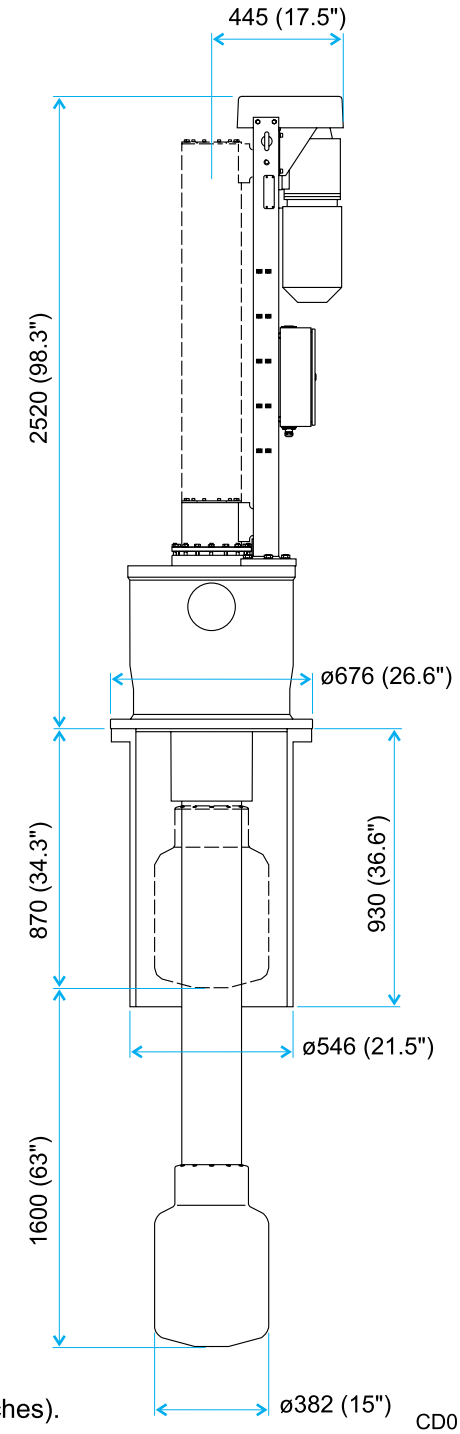
Rev.A

SX91 Hull unit dimensions



Note:
All measurements are in mm (and inches).
The drawing is not in scale.

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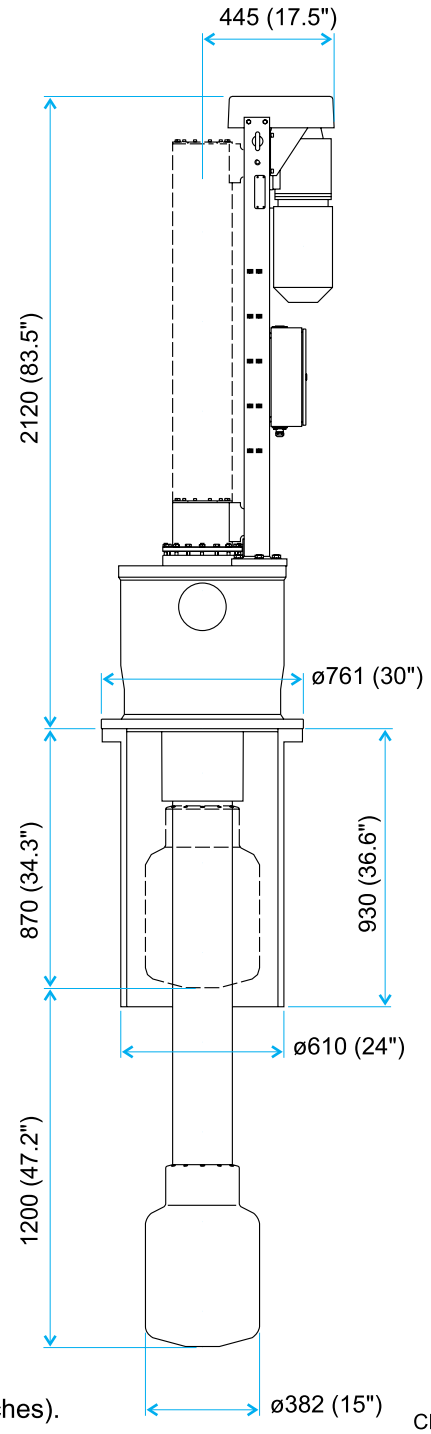
SX92 Hull unit dimensions



Note:
All measurements are in mm (and inches).
The drawing is not in scale.

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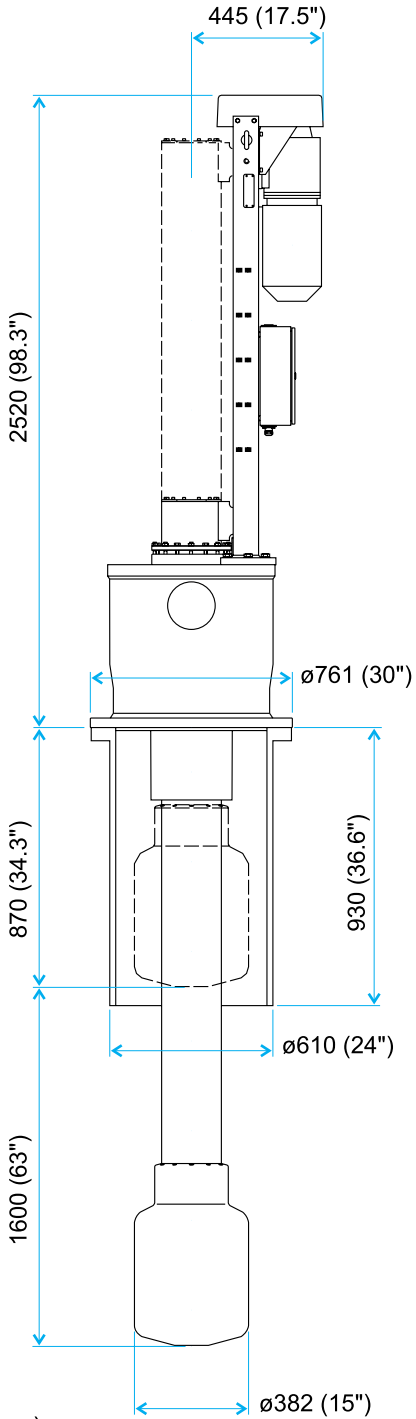
SX93 Hull unit dimensions



Note:
All measurements are in mm (and inches).
The drawing is not in scale.

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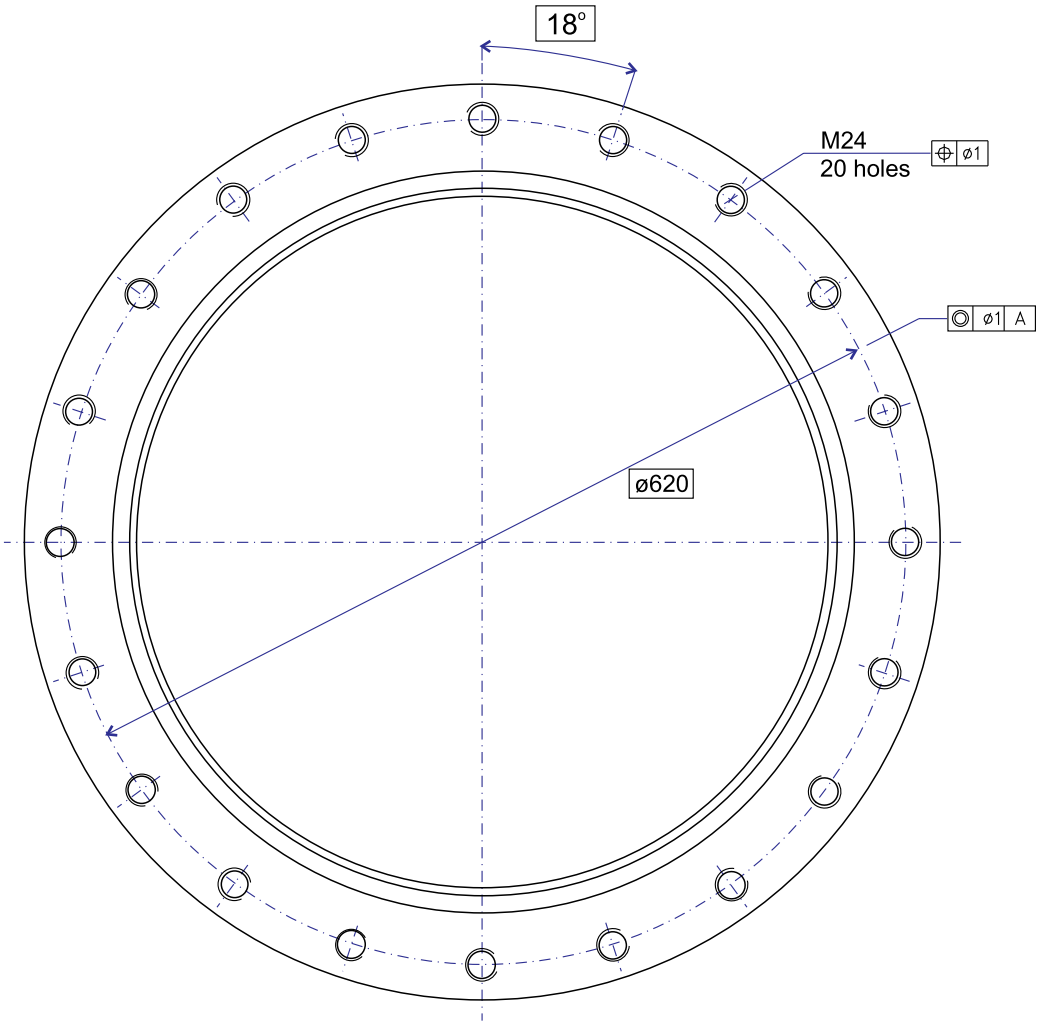
SX90/SX91 Mounting trunk drawing

Page 1



Note:
All measurements are in mm.
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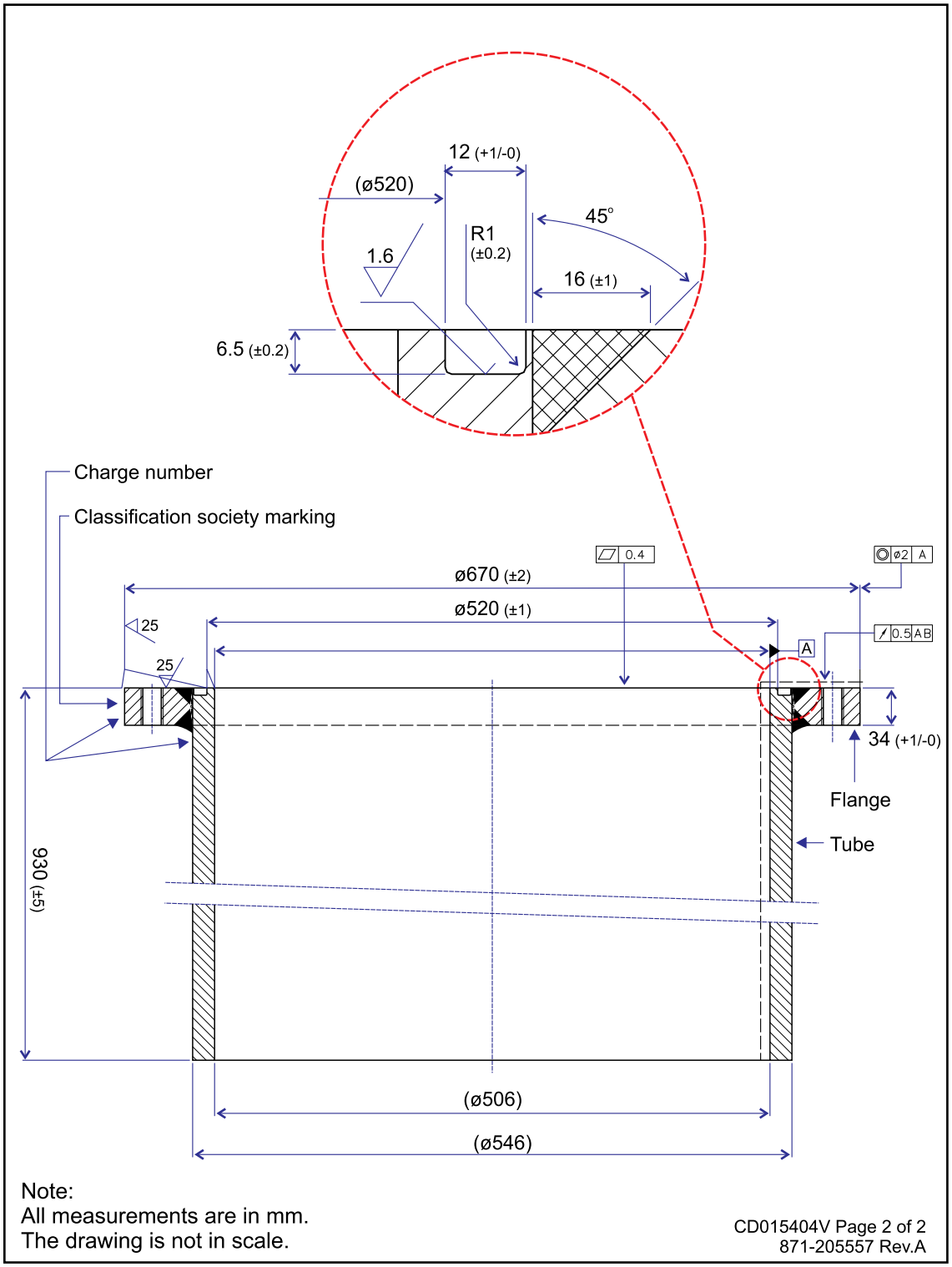
Page 2



Note:
All measurements are in mm.
The drawing is not in scale.

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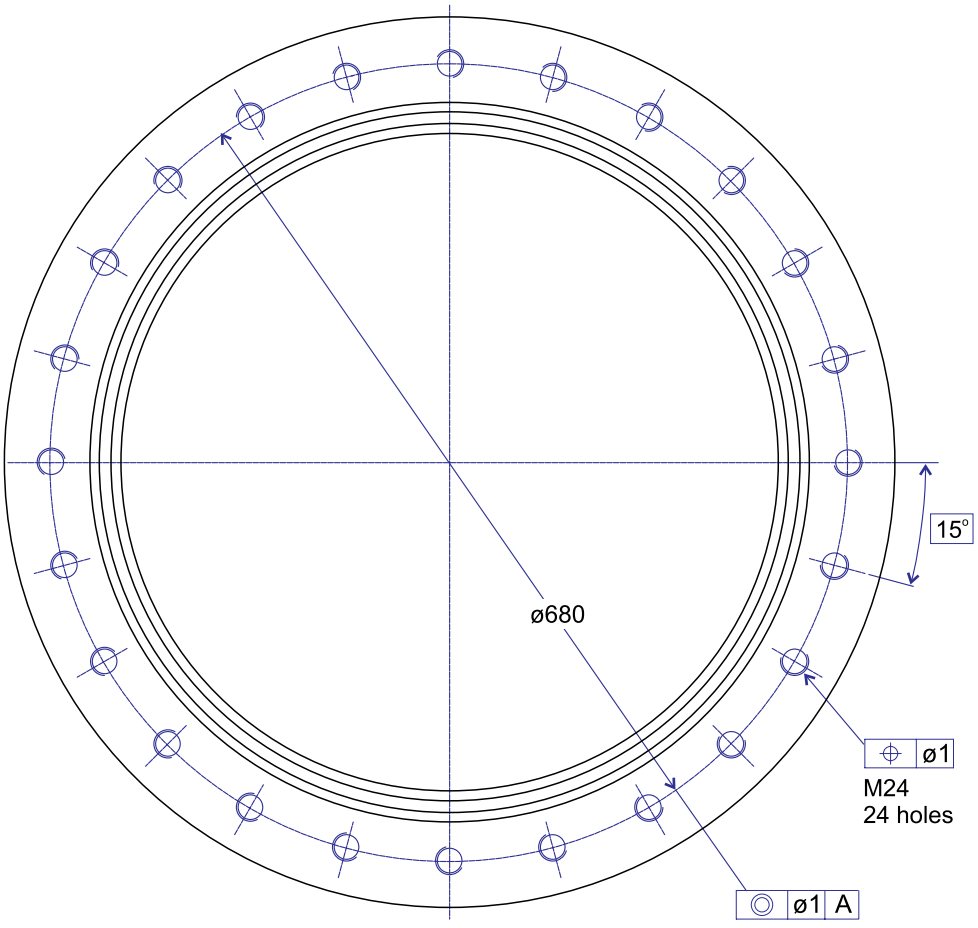
SX92/SX93 Mounting trunk drawing

Page 1



Note:
All measurements are in mm.
The drawing is not in scale.

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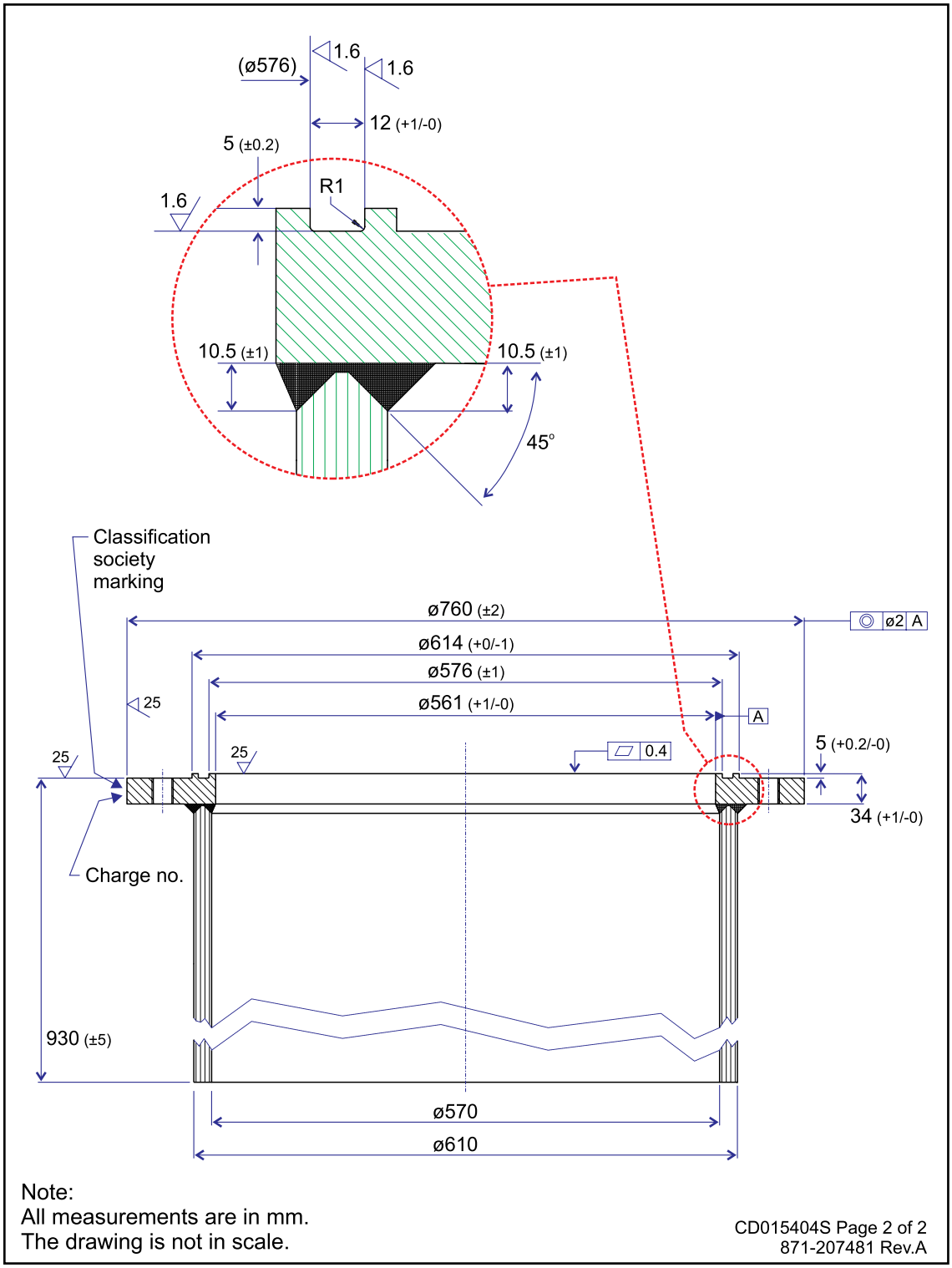
Page 2



Note:
All measurements are in mm.
The drawing is not in scale.

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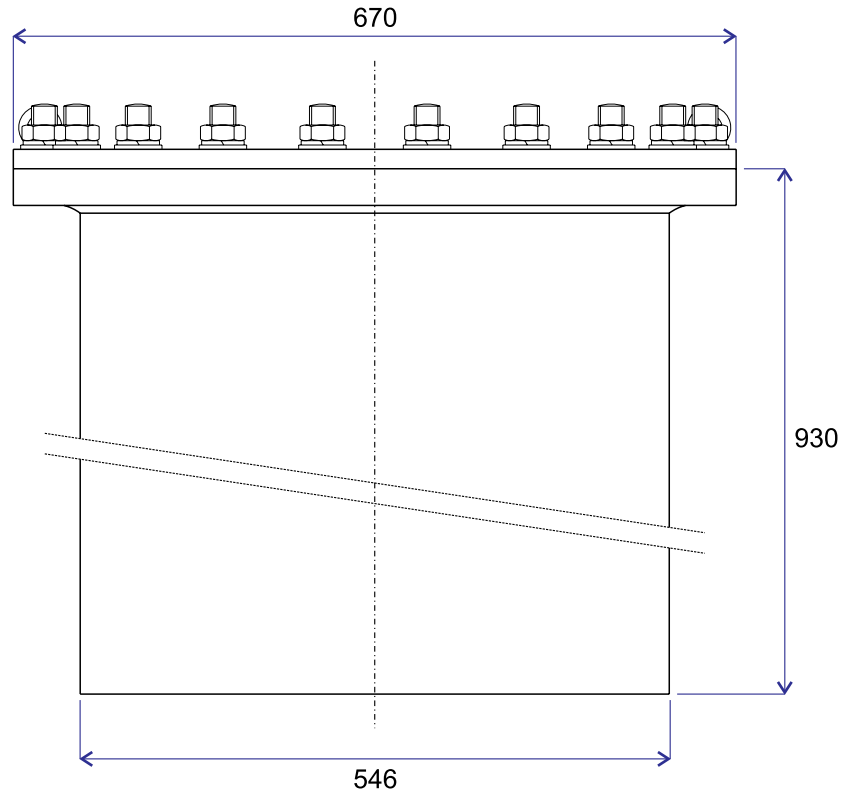
SX90/SX91 Mounting trunk outline dimensions



Note:
All measurements are in mm.
The drawing is not in scale.

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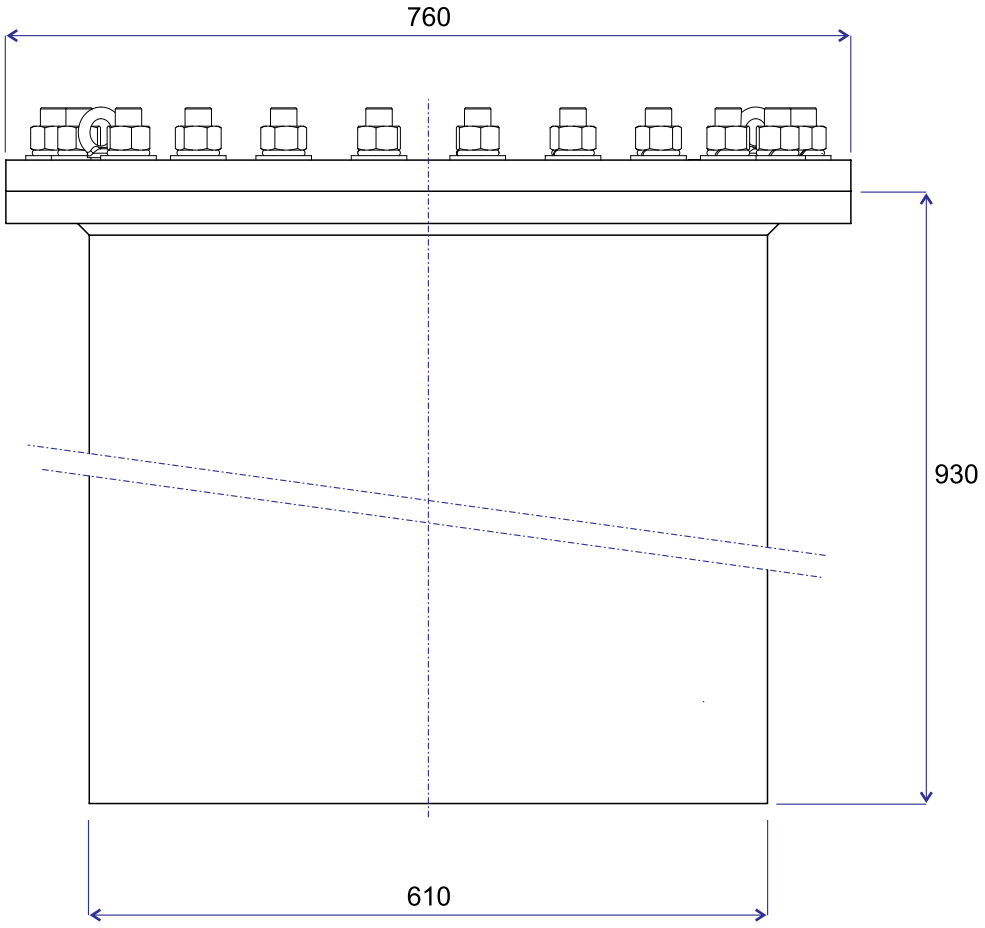
Page 1 of 1

SX92/SX93 Mounting trunk outline dimensions



Note:
All measurements are in mm.
The drawing is not in scale.

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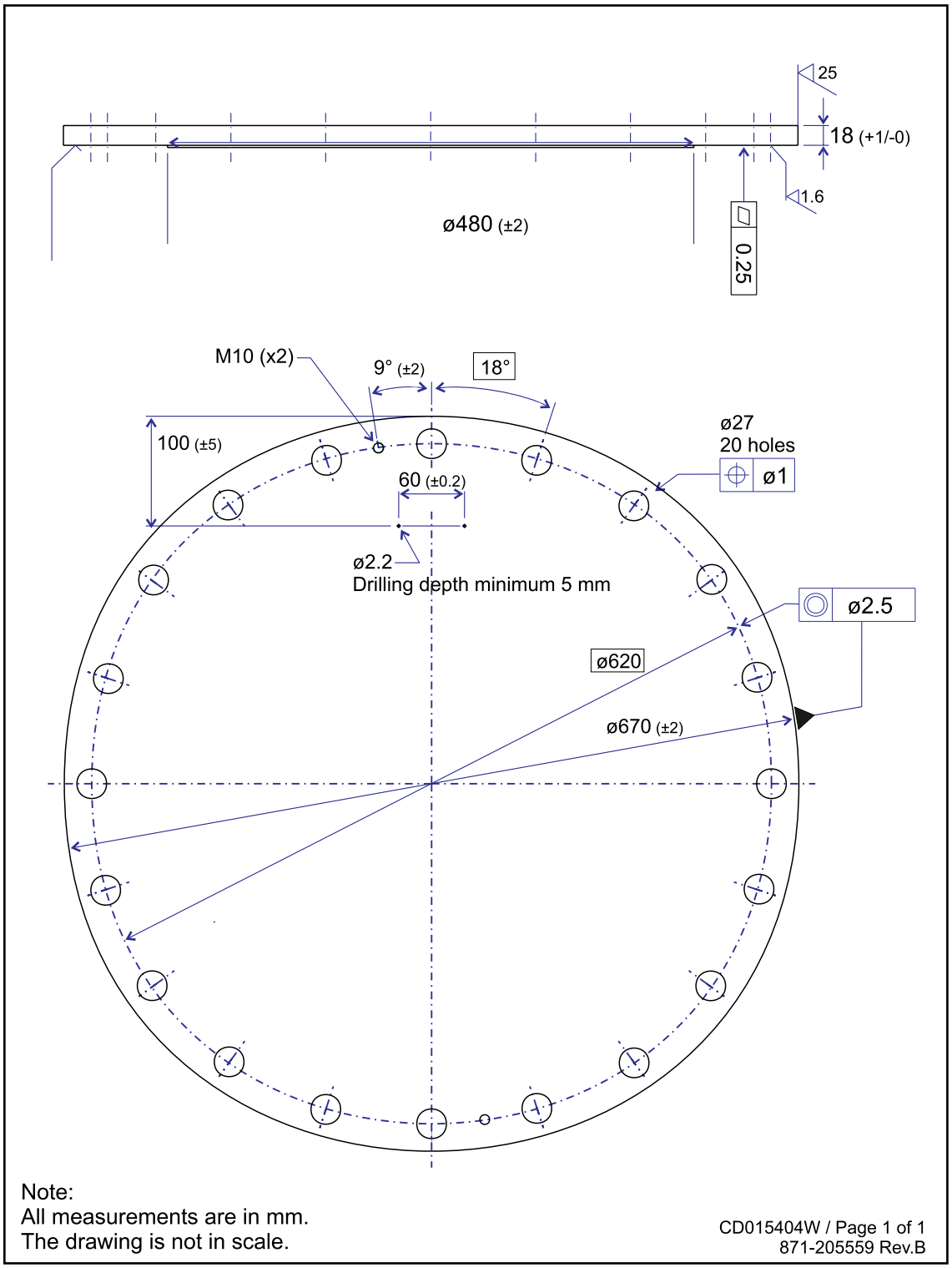
Page 1 of 1

SX90/SX91 Blind cover drawing



Note:
All measurements are in mm.
The drawing is not in scale.

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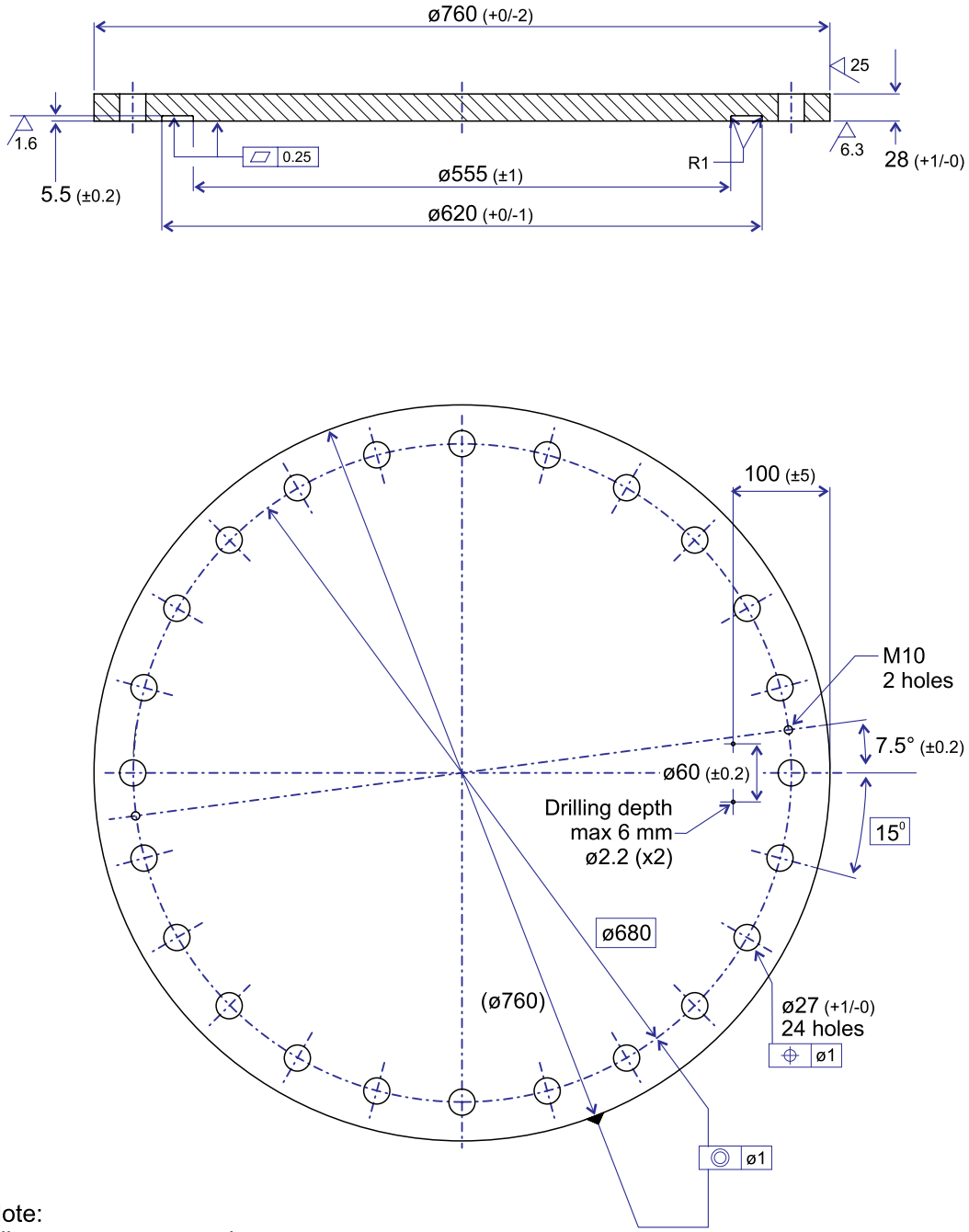
871-205559 Rev.B

SX92/SX93 Blind cover drawing



Note:
All measurements are in mm.
The drawing is not in scale.

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APPENDIX A — GENERAL SAFETY RULES

The Simrad SX90 operates on 230 Vac 50/60 Hz.

WARNING

This voltage is lethal!

The following safety precautions must be followed at all times during installation and maintenance work

- Always switch off all power before installation or maintenance. Use the main circuit breaker, and label the breaker with a warning sign that informs others that maintenance or installation work is being carried out on the system.
- Do not open the rack or cabinet doors while in rough seas. It may swing open suddenly and cause damage or injury.
- For safety reasons during troubleshooting on the equipment with power ON, two persons must always be present.
- Read and understand the applicable first aid instructions for electric shock.
- Whenever maintenance is carried out, it is essential that a first aid kit is available, and that the maintenance personnel are familiar with the first aid instructions for electrical shock.
- The various parts of the system may be heavy. Make sure that the appropriate tools and certified lifting equipment are available, and that the personnel are trained in installation and maintenance work.

APPENDIX B — EQUIPMENT HANDLING

This section provides the basic rules for transportation, storage and handling of units. In this context, a unit may be any large or small part of the system. It can be supplied as part of the initial delivery, or as a spare part.

Transportation

Unless otherwise stated in the accompanying documentation, electronic, electro-mechanical and mechanical units supplied by Simrad can be transported using all methods approved for delicate equipment; (by road, rail, air or sea). The units are to be transported in accordance with general or specific instructions for the appropriate unit(s), using pallets, transport cases, or carton boxes as appropriate.

Note

Special local restrictions concerning air transportation may be applied to units containing certain types of batteries. These units must be checked properly, and the regulations must be investigated by the packer/shipper before the unit is dispatched.

All local transportation must be carried out according to the same specifications as for the initial delivery. In general, all units must be handled with care.

The carton or case containing the unit must be kept dry at all times, and must be sheltered from the weather. It must not be subjected to shocks, excessive vibration or other rough handling. The carton or case will normally be marked with text or symbols indicating which way it is to be placed. Follow any instructions given, and ensure the case is always placed with its "top" uppermost.

The carton or case must not be used for any purpose for which it was not intended (step, table, etc.), and in the absence of other information, no other cartons or cases must be stacked on top of it.

Lifting

A heavy crate will normally be marked with its weight, and the weights of other cartons or crates will normally be entered on the packing list.

- You must always check the weight of a crate before you attempt to lift it.
- You must always use lifting apparatus that is approved and certified for the load.

Heavy units may be equipped with lifting lugs for transportation by crane within the workshop or installation area. Before you use a crane:

- You must check the applicable weight certificate for the crane.
- You must check the security of the lifting lugs.

Ensure that all available lifting lugs are used. Ensure the unit remains under control during the operation to avoid damage to the unit, equipment or personnel.

Heavy units may be transported using a forklift truck. Special attention must then be paid to the position of the unit's centre of gravity. The units must be properly secured to the truck.

Storage prior to installation or use

When a system, a unit or a spare part has been delivered to the customer, it may be subject to long time storage prior to installation and use. During this storage period, certain specifications must be met. The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.

1 The equipment must be stored in its original transportation crate.

2 Ensure that the units are clearly separated in the shelves and that each unit is easily identifiable.

3 The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

4 The crates must not be placed on top of each other, unless specific markings permit this.

5 The crates must not be placed directly on a dirt-floor.

6 Do not open the crate for inspection unless special circumstances permit so.

- "Special circumstances" may be suspected damage to the crate and its content, or inspections by civil authorities.
- If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Re-preserve the equipment.
- If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then re-pack the unit(s) according to the packing instructions.

7 If the crate has been opened, make sure that is it closed and sealed after the inspection. Use the original packing material as far as possible.

8 The storage room/area must be dry, with a non-condensing atmosphere. It must be free from corrosive agents.

9 The storage area's mean temperature must not be lower than -30° C, and not warmer than +70° C. If other limitations apply, the crates will be marked accordingly.

10 The crate must not be exposed to moisture from fluid leakages.

11 The crate must not be exposed to direct sunlight or excessive warmth from heaters.

12 The crate must not be subjected to excessive shock and vibration.

13 If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must only be reconnected before the installation starts. Units containing batteries are marked.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Inspection

An inspection must be carried out immediately after the unit(s) have arrived at their destination.

1 Check all wooden or cardboard boxes, plastic bags and pallets for physical damage. Look for signs of dropping, immersion in water or other mishandling.

2 If damage is detected externally, you will have to open the packaging to check the contents. Request a representative of the carrier to be present while the carton is opened, so any transportation damage can be identified.

3 If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Send the inspection report to Simrad as soon as possible.

4 If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then re-pack the unit(s) according to the packing instructions.

Unpacking

General unpacking procedure

Normal precautions for the handling, transportation and storage of fragile electronic equipment must be undertaken.

Note

If the unit is not to be prepared for immediate use, you may consider storing it unopened in its original packing material. However, it may be useful to open the case to check its contents for damage and retrieve any accompanying documentation.

Do not use a knife to open cardboard cartons - the contents may lie close to the surface, and may be damaged by the blade.

1 Check the carton before opening it to ensure it shows no signs of dropping, immersion in water or other mishandling. If the carton shows signs of such damage, refer to the paragraph covering Inspection on receipt.

2 Place the carton on a stable work bench or on the floor with the top of the carton uppermost.

3 In the absence of other instructions, always open the top of the carton first. The contents will normally have been lowered into the carton from above, so this will usually be the easiest route to follow. Care must be used when opening the carton to ensure the contents are not damaged. Do not use a knife to open cardboard cartons

4 If the carton has been closed using staples, remove the staples from the carton as you open it. This will reduce the possibilities of scratch injury to yourself and damage to the contents.

5 If a wooden crate has been closed using screws, always remove them using a screwdriver. Do not attempt to prise the lid off with a crowbar or similar.

6 Once the carton is open, carefully remove all loose packing and insulation material. Check for manuals and other documents that may have been added to the carton during packing, and put these to one side. Check also for special tools, door keys etc.

Unpacking electronic and electromechanical units

Electronic and electromechanical units will normally be wrapped in a clear plastic bag. Lift the unit, in its bag, out of the carton and place it in a stable position on the floor/work bench.

Inspect the unit for damage before opening the plastic bag.

Note

Beware of the dangers of Electro-Static Discharge (ESD) both to yourself and to the equipment, when handling electronic units and components.

*Cables must **never** be used as carrying handles or lifting points.*

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturer with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.

Assuming all is well, open the bag and remove the unit.

Open the unit and check inside. Remove any packing and desiccant material that may be inside.

Unpacking mechanical units

Mechanical units may be heavy. Using a suitably certified lifting apparatus, lift the unit out of the crate and place it in a stable position on the floor/work bench.

Inspect the unit for damage and remove any packing material that may be inside the unit.

Unpacking transducers

Transducers may be supplied mounted to a hull unit (if any), or packed separately. Crates are normally identified by the order number and the serial number.

The transducer face must be protected by a rigid, padded cover (e.g. a wooden box lined with foam rubber) all the time it is exposed to the risk of physical damage.

Caution

Once transducer is unpacked, great care must be taken to ensure that transducer body and cabling is not exposed to any mechanical stress.

Storage after unpacking

The unit must whenever possible be stored in its original transportation crate until ready for installation. The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

Once unpacked, the equipment must be kept in a dry, non condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

Note

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturers with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.

The unit must be installed in its intended operating position as soon as possible after unpacking. If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must then be reconnected during the installation procedure. Units containing batteries are marked.

Note

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Storage after use

If a unit is removed from its operating location and placed into storage, it must be properly cleaned and prepared before packing.

Cleaning cabinets

If a cabinet has been exposed to salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

1 Wipe the cabinet externally using a damp cloth and a little detergent. Do not use excessive amounts of water as the unit may not be water tight. On completion, dry the unit thoroughly.

2 All surfaces must be inspected for signs of corrosion, flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums for the unit. The mediums to be used will usually be defined in the units' maintenance manual.

3 Open the unit, and using a vacuum cleaner, remove all dust etc. from the unit. Great care must be taken to ensure the circuit boards and modules are not damaged in the process.

Mechanical units

If a mechanical unit may has been exposed to a salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

1 If the construction materials and type of unit permits, wash the unit using a high-pressure hose and copious amounts of fresh water. Examples are the lower parts of hull units (outside the hull) or subsea units

2 Ensure that all traces of mud and marine growth are removed. Use a wooden or plastic scraper to remove persistent growth, barnacles etc. On completion, dry the unit thoroughly.

Caution

Do not use a high pressure hose in the vicinity of cables or transducers. Do not use sharp or metal tools on a transducer face.

3 If the materials or type of unit prevents the use of a high-pressure hose, wipe the unit using a cloth dampened with water containing a little detergent. Examples are the upper parts of hull units (inside the hull) and hydraulic systems

4 Do not use excessive amounts of water as some components on the unit may not be water tight. Wipe off the detergent with a damp cloth, then dry the unit thoroughly.

5 All surfaces must be inspected for signs of corrosion, flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums. The mediums to be used will normally be defined in the unit's maintenance manual.

Cables

Wipe clean all exposed cables, and check for damage. If a cable shows signs of wear or ageing, contact Simrad for advice.

Internal batteries

If the unit contains batteries, these may discharge slowly during storage. If the unit is to be stored for an extended period, disconnect or remove all internal batteries.

A suitable piece of insulating material can be placed between the battery and the electrical contacts to prevent electrical discharge. The battery can then remain in the unit, reducing the risk of it being misplaced during the storage period.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Dehumidifier

Place a suitably sized bag of desiccant material (silica gel or similar) into the unit to keep the electronic components as dry as possible.

Coatings

Spray the unit externally with a corrosion inhibitor (e.g. a light oil) before packing.

Re-packaging

Whenever possible, the unit must be stored and transported in its original packing material and/or crate. In the event that this material is not available, proceed as follows:

- Small units must be protected from damp by being placed within a plastic bag at least 0.15 mm thick. An appropriate quantity of desiccant material should be placed inside this bag, and the bag sealed. The sealed unit must then be placed in an appropriate carton or crate, and supported in the container by appropriate shock-absorbing insulation (polystyrene foam chips etc.).
- Large units must be placed in a suitable cardboard box or wooden crate. The unit must be protected against physical damage by means of shock-absorbing insulation mats. The box must be clearly marked with its contents, and must be stored in a dry and dust-free area.

Temperature protection

If the unit must be protected against extremes of temperature, the carton/crate must be lined on all walls, base and lid with 5 cm thick polyurethane or polystyrene foam. These units will be identified as delicate in the applicable documentation.

The package must then be clearly marked:

Must not be transported or stored in temperatures below -5 degrees Celsius.

Other units can normally be stored in temperatures between -30° C and +70° C, refer to the system's technical specifications for details.

Unless otherwise specified, transducers must not be stored in temperatures below -20° C and above +60° C.

Circuit board handling and packaging

Circuit boards are delicate items. They may work year after year in an advanced product, but then fail due to a small spark of static electricity. For this reason, it is very important that they are properly handled and protected during shipping.

Beware of ESD!

When you handle electronic circuit boards, you must beware of the dangers of electrostatic discharge (ESD), both to yourself and to the equipment. In order to ensure safe transport and storage, circuit boards and other electronic units will always be wrapped in a clear plastic protective bag, and the bag will be sealed. See also section *Electro-Static Discharge (ESD)* on page 210.

Unpacking and handling circuit boards

To unpack a circuit board:

- Wherever possible, prepare a suitable workbench. It must have an approved conductive service mat, and it must be connected directly to a reliable earth point via its earthing cord. You must wear a wristband in direct contact with the skin, and the wristband must be connected to the service mat.
- Lift the circuit board, in its protective bag, out of the carton and place it in a stable position on the a floor/work bench.
- Inspect the unit for damage before you open the plastic bag.
- Do not break the seal to open a circuit board package before the board shall to be used. If the board package is returned with the seal broken, we will assume that the content has been used, and we will bill you accordingly.
- Assuming all is well, open the bag and remove the unit.
- Take out and keep the documentation. You will need it if the circuit board shall be returned to us. Also, remove any packing and desiccant material that may be inside.
- Keep the protective plastic bag for future use.

Unpacking on board the vessel

When you are working on board a vessel, an “approved conductive service mat” is often far away. As you still need to unpack circuit boards, make sure that you do it in the instrument room, or at another location where you have a steel deck. Keep far away from the bridge or any other rooms with wall-to-wall carpets! If possible, bring a wristband and ground yourself.

Returning a circuit board

If you wish to return a circuit board to us, observe the following rules.

- Place the circuit board to be returned in the same protective plastic bag as you originally received it in - or a protective bag of similar ESD protection quality.
- DO NOT use standard plastic bags, such as commercial bubble wrap.
- Fill in all the necessary information on the applicable documentation and place it inside the bag.
- Seal the bag.
- Place the circuit board in a suitable carton, and secure it for shipping.

Note

Failure to follow these rules may result in unserviceable circuit boards.

Electro-Static Discharge (ESD)

What is ESD?

Electro-Static Discharge (ESD) is the transfer of an electrostatic charge between two bodies at different electrostatic levels, caused either by direct contact or induction by an electrostatic field. The passing of a charge through an electronic device can cause localised overheating, and it can also “puncture” insulating layers within the structure of the device. This may deposit a conductive residue of the vaporised metal on the device, and thus create a short circuit. This may result in a catastrophic failure, or degraded performance of the device.

ESD protection

Sensitive electronic circuit boards must be transported and stored in protective packing bags. The circuit boards must not be transported or stored close to strong electrostatic, electro-magnetic or radioactive fields.

If it is necessary to open and touch the circuit board inside the protective bag, then the following precautions must be taken:

1 The working area must be covered by an approved conductive service mat that has a resistance of between 50 kΩ and 2 MΩ, and is connected directly to a reliable earth point via its earthing cord.

2 The service personnel involved must wear a wristband in direct contact with the skin, connected to the service mat.

3 Printed circuit boards must be placed on the conductive service mat during installation, maintenance etc.

4 If, for any reason, it is necessary to move the circuit board from the conductive service mat, it must be placed in an approved antistatic transportation container (e.g. static shielding bag) before transportation.

5 During installation and servicing, all electrical equipment (soldering irons, test equipment etc.) must be earthed.

APPENDIX C — SX90 CABLE DETAILS

This appendix provides detailed information related to the installation of system cables.

Topics

- *Cabling principles* on page 212
- *Cables to peripheral devices* on page 213
- *Cable drawings* on page 217

Related topics

- *Cable plan* on page 72
- *List of cables* on page 74
- *Cable procedures* on page 79

Cabling principles

This chapter provides generic information about the cabling principles.

Cable identifications

On the cable layout drawing and in the corresponding cable list(s), all cables are identified with individual cable numbers. Unless otherwise defined, each cable is identified with a **Cxx** number, where **xx** is an integer. References are made to dedicated cable drawings. If required, the shipyard or owner may also identify the cables according to their own system. Unless otherwise specified, this document will however only refer to the identification numbers provided by Simrad.

Cable parameters

A drawing with additional parameter specifications for each cable is provided. Each cable drawing may, when applicable, include:

- Required minimum specifications
- Connections at each end (including reference to the corresponding: system unit, terminal board identification and plug/socket to be used)
- Corresponding terminations
- Number of cores

System and shipyard cables

Cables fall into two categories.

- **System cables:** These cables are supplied by Simrad.
- **Shipyard cables:** These cables must be provided by the shipyard performing the installation, or the shipowner.

Note

Simrad accepts no responsibility for damage to the system or reduced operational performance caused by improper wiring.

Cables to peripheral devices

This section explains how to connect the various peripheral interfaces to the Simrad SX90.

Topics

- *Positioning system interface* on page 213
- *Echo sounder system interface* on page 214
- *Trawl sonar interface* on page 214
- *Catch monitoring system interface* on page 215
- *Current meter interface* on page 215
- *Radio buoys connection interface* on page 215

Positioning system interface

A standard or differential global positioning system (GPS) can be connected to the SX90 to indicate the latitude and longitude position of the vessel, cursor, markers and targets. In addition to the navigational data, the GPS system may also be used for the input of the speed log information. Most GPS systems are equipped to present the course information, but this data is generally too inconsistent to provide a stable sonar presentation. The sonar can read the GPS data from a serial line with a standard NMEA 0183 telegram format.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

For physical connection to the GPS unit, refer to the applicable GPS documentation.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218
- *Positioning system interface setup and test* on page 150

Echo sounder system interface

To provide depth information on the sonar, an echo sounder with standard NMEA 0183 output format (serial line) may be connected. Most Simrad echo sounders have the depth output available on a serial line.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

For connection to a Simrad echo sounder using a serial line, refer to information listed below. This is a “one-way” connection, since the sonar does not output any data that are useful for the echo sounder. For physical connection to a third party echo sounder, refer to the applicable echo sounder documentation.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218
- *Echo sounder system interface setup and test* on page 151

Trawl sonar interface

The Simrad SX90 can read the trawl data from a Simrad FS20, FS25 or FS70 Trawl sonar or the Simrad ITI (Integrated Trawl Instrumentation) system. The communication is achieved using a serial line.

When connecting the FS Series Trawl sonar to the sonar, the trawl depth will automatically be shown in accordance with the surface, targets and bottom in the vertical modes on the sonar. When the ITI trawl system is connected to the SX90, the information exchanged between the ITI and sonar are:

- ITI to sonar:
  - Trawl position relative to vessel ($IITPT)
  - Depth of trawl below surface ($IIDBS)
  - Trawl headrope to footrope distance (@IIHFB)
  - Trawl door spread (@IITDS)
  - Trawl filling (@IITFI)
  - Water temperature at trawl ($IIMTW)
- Sonar to ITI:
  - Position of target or marker (@SSTPP)

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

For connection to a FS20, FS25, FS70 or ITI trawl system, refer to the information listed below. For physical connection to a third party trawl system, refer to the applicable trawl system documentation.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218
- *Trawl system interface setup and test* on page 151

Catch monitoring system interface

To provide purse seine depth information on the sonar's display, one of the Simrad catch monitoring systems may be connected. You can also interface a third party catch monitoring system.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

For connection to a PI30, PI32, PI44 or PI54 catch monitoring systems, refer to the information listed below. For connection to a third party trawl system, refer to the applicable catch monitoring system documentation.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218
- *Catch monitoring interface setup and test* on page 152

Current meter interface

The Simrad SX90 can read the data from the following current meter systems:

- Kaijo DCG-200

The interface is based on a serial line provided on connector J26 (9-pin 'D' connector) on the Kaijo "C82" unit. For additional information about the telegrams provided as well as necessary setup, refer to the relevant installation manual.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218
- *Current meter interface setup and test* on page 153

Radio buoys connection interface

The Simrad SX90 can read the data from one of the following GPS based radio buoy systems:

- SERPE
- Ariane
- Ryokusei

All these systems are interfaced by means of a serial line. For connection to the radio buoy system, refer to the output described in the applicable radio buoy system documentation.

Connect the serial line to any vacant port on the Processor Unit as described in section *Moxa CP-134U-I serial adapter* on page 218.

Related topics

- *Moxa CP-134U-I serial adapter* on page 218
- *Radio buoy system interface setup and test* on page 153

Cable drawings

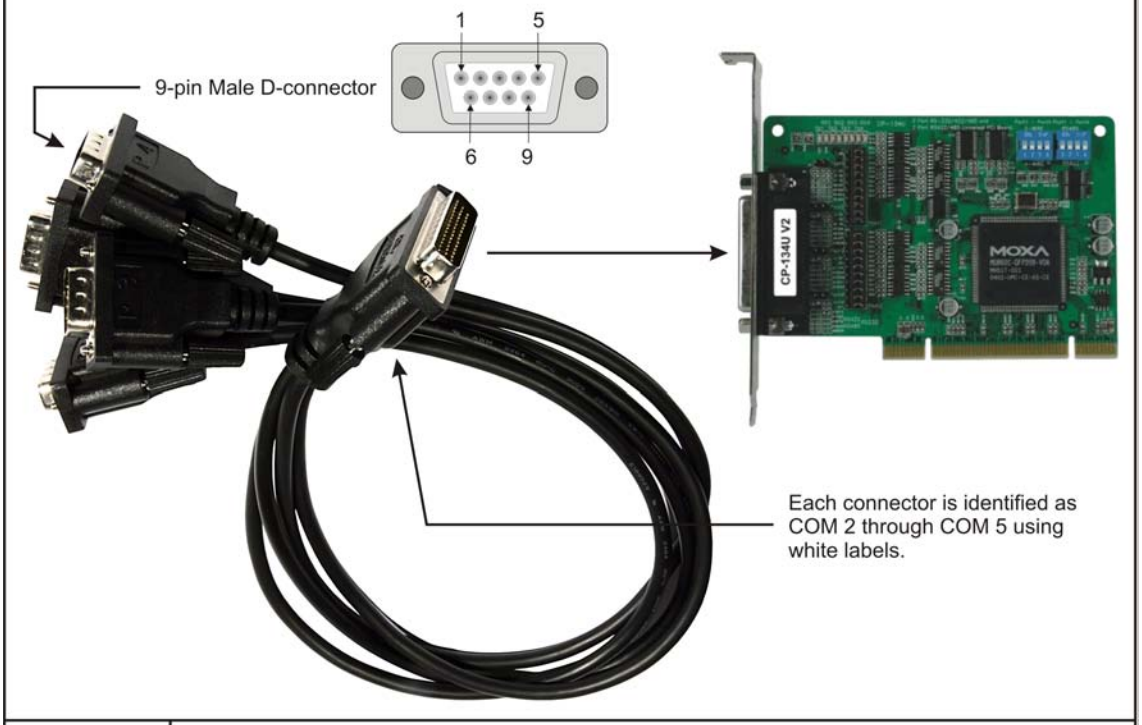
The drawings provided specify in detail each cable used by the Simrad SX90.

Cable drawings and specifications

- *Moxa CP-134U-I serial adapter* on page 218
- *Mini-jack-to-phono audio cable* on page 220
- *Vessel ground* on page 221
- *AC mains (IEC 60320)* on page 222
- *AC mains to Motor Control Unit* on page 223
- *AC mains with IEC320/C7* on page 224
- *DC power supply* on page 225
- *RJ45 Ethernet, straight* on page 226
- *VGA/SVGA Display* on page 227
- *Universal Serial Bus (USB)* on page 228
- *DVI–I Display* on page 229
- *Powered speaker system* on page 231
- *Operating Panel "Dual"* on page 233

Moxa CP-134U-I serial adapter

The Processor Unit is equipped with a **Moxa CP-134U-I** serial interface board. By default, each board provides four RS-422 serial lines. The connections to the board are made using four 9–pin D-connectors, and short converter cables with terminal boards are provided with the system.



W144 Rev.A	Interface to Moxa CP 134U-I

Cable specifications

- **Conductors**: 5 x 2 x 0.5 mm²
- **Screen**: Screened twisted pairs and overall braided
- **Voltage**: 60 V
- **Maximum diameter**: Limited by the plugs

Pin assignments

This board supports RS-422 and RS-485 (both 2 and 4-wire). Ports 1 and 2 also support RS-232. The board is provided with a four way connector cable (CBL-M44M9x4-50) to offer four 9–pin male D-connectors.

Table 21 Moxa CP-134U-I 9–pin D-connector converter

Pin	RS-232	RS-422	RS485 (4–wire)	RS485 (2–wire)
1	DCD	TXD-(A)	TXD-(A)	—
2	RxD	TXD+(B)	TXD+(B)	—
3	TxD	RXD+(B)	RXD+(B)	Data-(B)
4	DTR	RXD-(A)	RXD-(A)	Data-(A)
5	GND	GND	GND	GND
6	DSR	—	—	—
7	RTS	—	—	—
8	CTS	—	—	—
9	—	—	—	—

Mini-jack-to-phono audio cable

This is a commercial cable. The mini-jack connects to the audio output (green) on the rear side of the Processor Unit. The other end is terminated with two phono connectors to fit most commercial audio systems. For more information about the plug type, see http://en.wikipedia.org/wiki/Mini-jack.

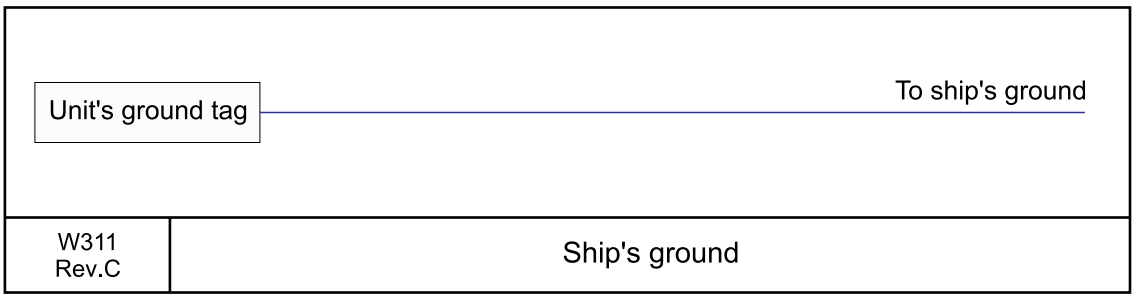
W206D Rev.A	Audio output with commercial minijack-to-phono cable

Cable specifications

- Not applicable. This is a commercial cable.

Vessel ground

This cable is used to connect a system unit to the ship’s ground. Note that this cable must be as short as possible.

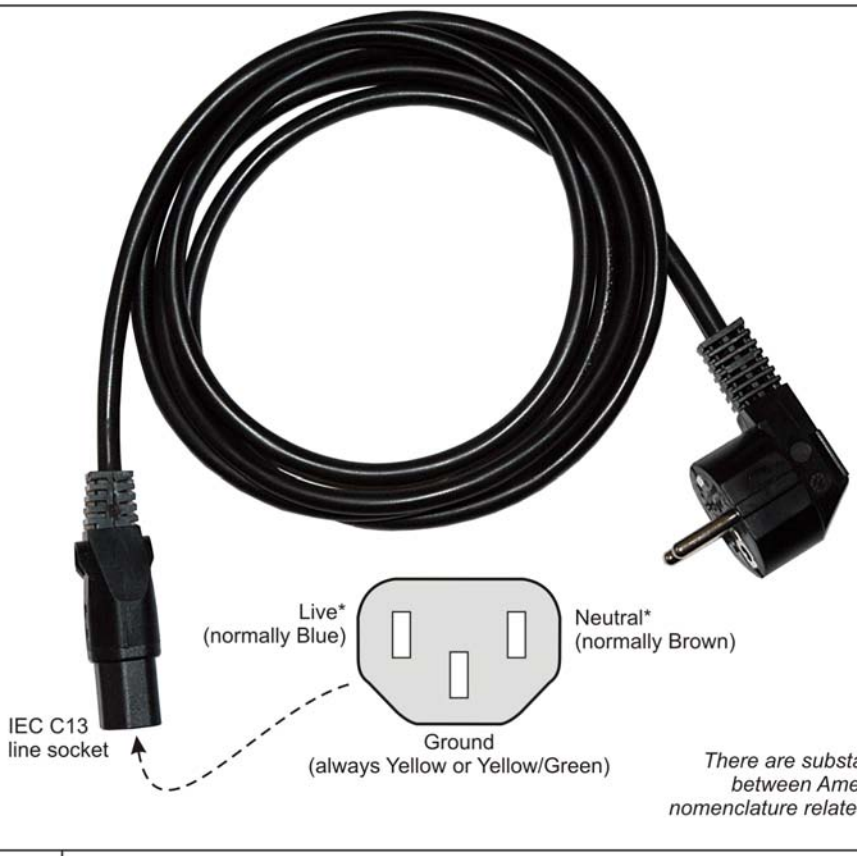


Cable specifications

- **Conductors**: 1 x 6 mm²
- **Screen**: None
- **Voltage**: 60 V
- **Maximum diameter**: N/A

AC mains (IEC 60320)

This is a commercial 230 Vac power cable for mains power. One end is fitted with an IEC plug, the other with a standard European mains plug. This is a standard cable type supplied in different lengths.



W320 Rev.C	Commercial power cable for AC mains

Cable specifications

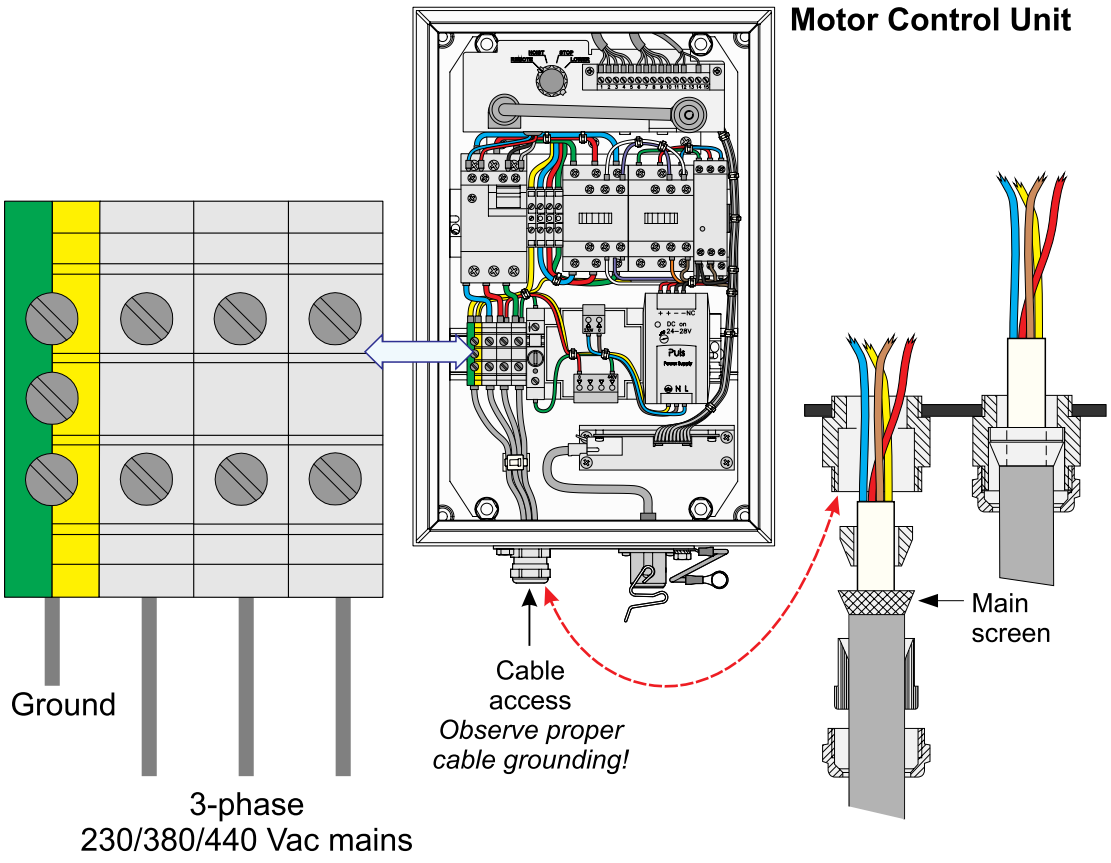
- **Conductors**: 2 x 1.5 mm² + GND
- **Screen**: None
- **Voltage**: 750 V
- **Maximum diameter**: Set by the plugs

More information

- http://en.wikipedia.org/wiki/IEC_320

AC mains to Motor Control Unit

This cable is used to connect 3-phase mains supply and ship's ground to the hoisting motor on the hull unit. The connections are made to the Motor Control Unit.



W323 Rev.B	AC Mains supply, Motor Control Unit

Caution

Observe the difference between 230 Vac and 380/440 Vac wiring on the hoisting motor!

Cable specifications

- **Conductors**: 4 x 2.5 mm²
- **Screen**: Overall braided
- **Voltage**: 750 V
- **Maximum diameter**: 17 mm

AC mains with IEC320/C7

This is a commercial 230 Vac power cable for 2-phase mains power. One end is fitted with an IEC320/C7 plug, the other with a standard European mains plug. This is a standard cable type supplied in different lengths.

W324 Rev.A	Commercial power cable for 110-230 Vac 2-phase

Cable specifications

- Not applicable. This is a commercial cable.

DC power supply

This is a commercial low voltage DC power supply. The input is a standard IEC320/C8 connector. The output cable is fastened to the power supply, and holds a standard circular plug. The polarity is printed on the supply.

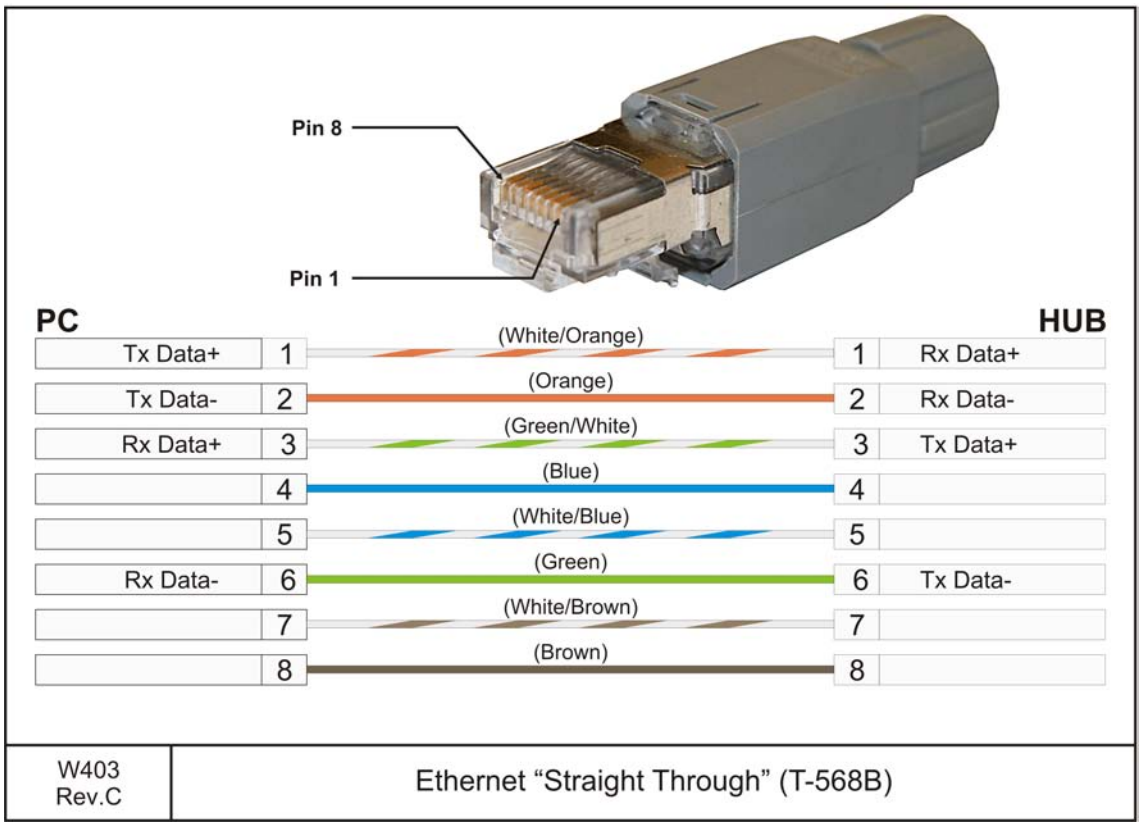
W325 Rev.A	Commercial power supply

Cable specifications

- Not applicable. This is a commercial cable.

RJ45 Ethernet, straight

This cable is used to provide standard Ethernet connections. Note that various categories exists. Normally, **CAT-5E** and **CAT-6** cables are used in local area networks with bandwidth exceeding 100 Mbit. Ethernet cables are available commercially in different lengths, colours and categories.



Cable specifications

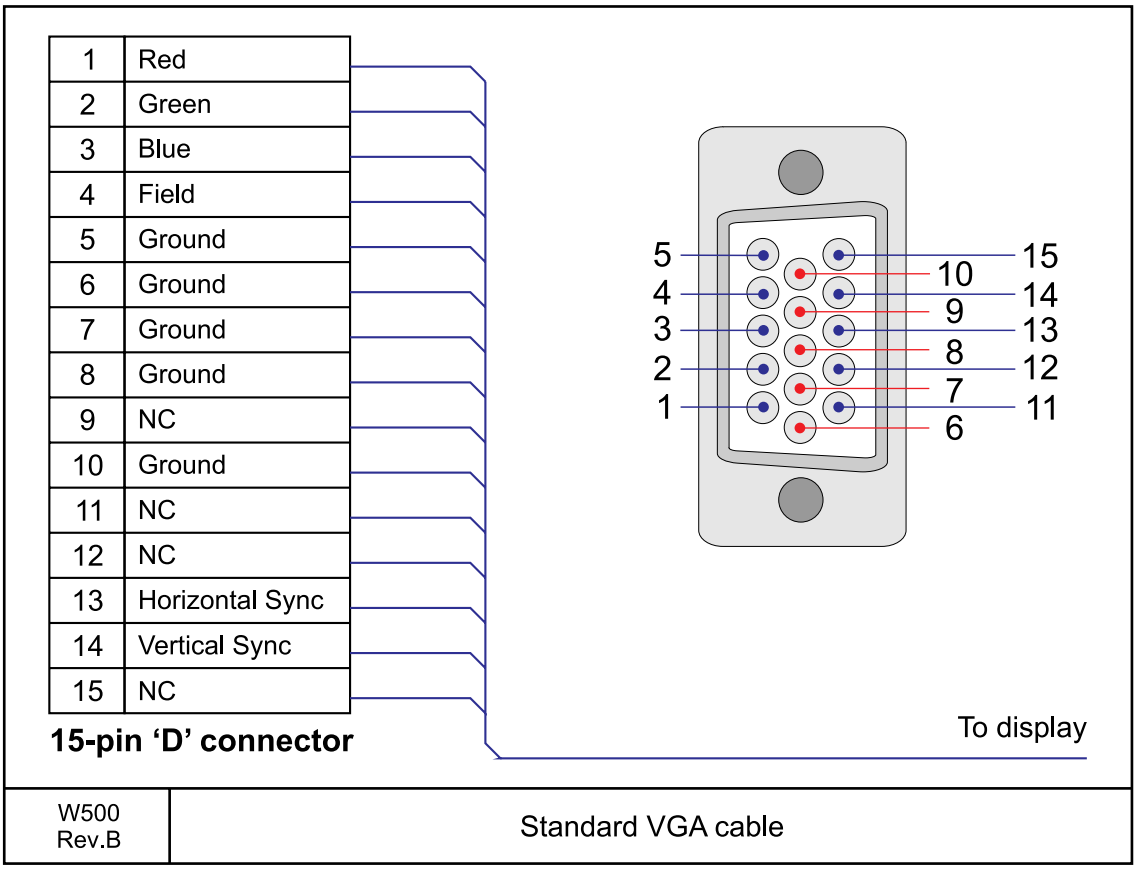
- Not applicable. This is a commercial cable.

More information

- http://en.wikipedia.org/wiki/TIA/EIA-568-B
- http://en.wikipedia.org/wiki/Category_5_cable

VGA/SVGA Display

This is a standard VGA and SVGA video cable. One end is normally connected to the display, while the other end is terminated in a standard D-connector.



Cable specifications

- Not applicable. This is a commercial cable.

Universal Serial Bus (USB)

Just about any computer that you buy today comes with one or more Universal Serial Bus (USB) connectors on the back. These connectors let you attach everything from mouse to printers to your computer quickly and easily. Since the operating system supports USB, installation of device drivers is also easy. In most cases, the USB cable is commercial, and they are normally supplied with the external devices, However, USB cables are also available commercially in different fixed lengths.

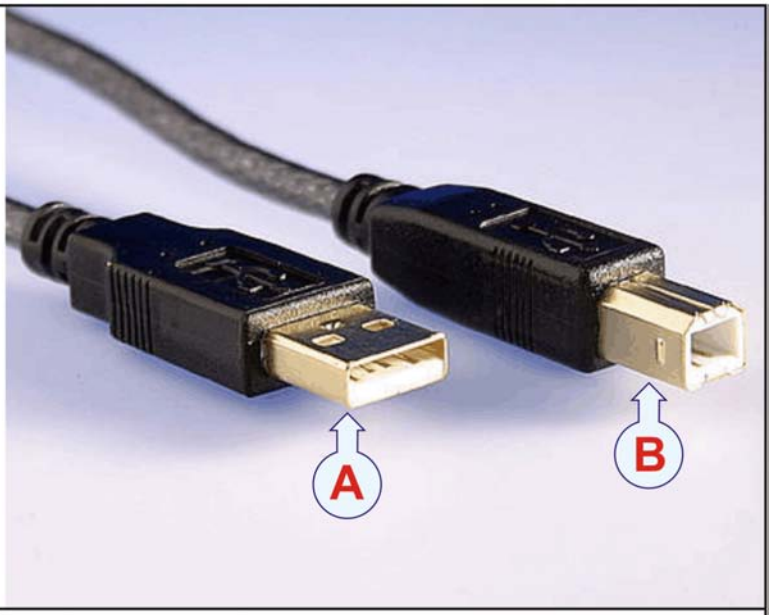
Universal Serial Bus (USB) cable terminated with an **A-plug** in one end and a **B-plug** in the other.

Internal cables:

Pair 1:
28 AWG twisted pair (data, green, white)

Pair 2:
20 AWG twisted pair (Power, red, black)

Shield:
Foil and braid



W501 Rev.B	Commercial USB cable

Cable specifications

- Not applicable. This is a commercial cable.

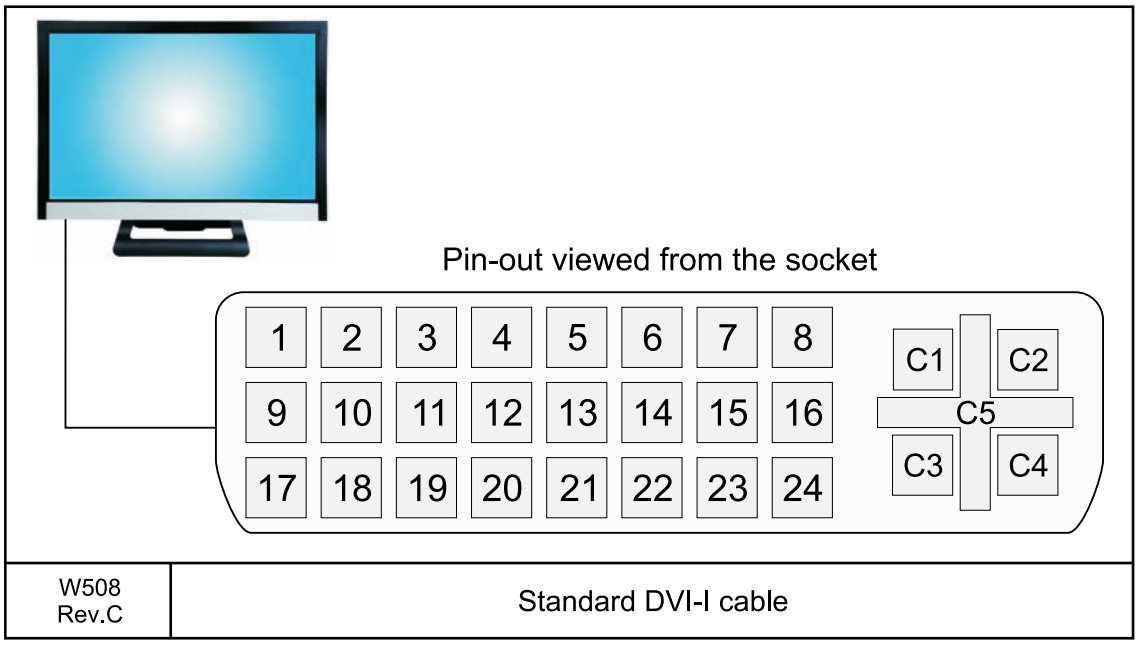
More information

- http://en.wikipedia.org/wiki/usb

DVI–I Display

This cable is a standard DVI-I cable. It is normally provided with the colour display.

For more information about the DVI signals, see http://en.wikipedia.org.



Pin	Signal	Pin	Signal
1	TMDS Data 2- (Digital red - (Link 1))	15	Ground (Return for pin 14 and analog sync)
2	TMDS Data 2+ (Digital red + (Link 1))	16	Hot plug detect
3	TMDS Data 2/4 shield	17	TMDS data 0- (Digital blue - (Link 1) and digital sync)
4	TMDS Data 4- (Digital green - (Link 2))	18	TMDS data 0+ (Digital blue + (Link 1) and digital sync)
5	TMDS Data 4+ (Digital green + (Link 2))	19	TMDS data 0/5 shield
6	DDC clock	20	TMDS data 5- (Digital red - (Link 2))
7	DDC data	21	TMDS data 5+ (Digital red + (Link 2))
8	Analog vertical sync	22	TMDS clock shield
9	TMDS Data 1- (Digital green - (Link 1))	23	TMDS clock+ (Digital clock + (Links 1 & 2))
10	TMDS Data 1+ (Digital green + (Link 1))	24	TMDS clock- (Digital clock - (Links 1 & 2))
11	TMDS Data 1/3 shield	C1	Analog red
12	TMDS Data 3- (Digital blue - (Link 2))	C2	Analog green
13	TMDS Data 3+ (Digital blue + (Link 2))	C3	Analog blue

Pin	Signal	Pin	Signal
14	+5 Vdc (Power for monitor when in standby)	C4	Analog horizontal sync
TMDS = Transition Minimized Differential Signaling		C5	Analog ground (Return for R, G and B signals)

Powered speaker system

This section explains how to connect a powered speaker system to the SX90. The audio system comprises two loudspeakers and a power supply. One of the loudspeakers is “active”, it contains the amplifier, and various controllers for the sound volume and quality. The “active” loudspeaker also provides a headphones socket.

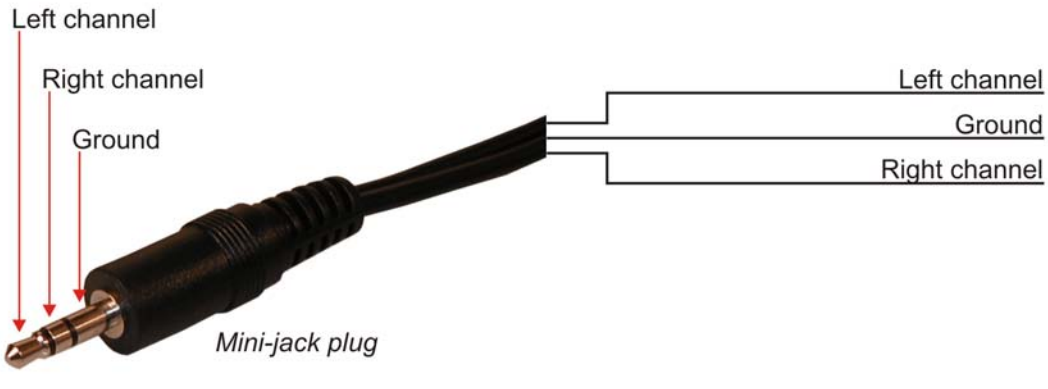
Three cables are used. All are normally provided with the powered speaker system.

- Audio cable from the computer to the “active” speaker. This is normally a cable with stereo mini-jack connectors on each end. See *Audio cable* on page 231.
- Power supply cable. Several power supply types may be in used. Some plug directly into the mains socket, others are provided with AC mains input and low voltage AC or DC output cables. See *Power supply* on page 232.
- Speaker cable from the “active” to the “passive” loudspeaker. This cable is often permanently attached to the “passive” loudspeaker. See *Wiring* on page 232.

Note

The power supply and speakers shown are provided as an example. Several commercial types are available.

Audio cable

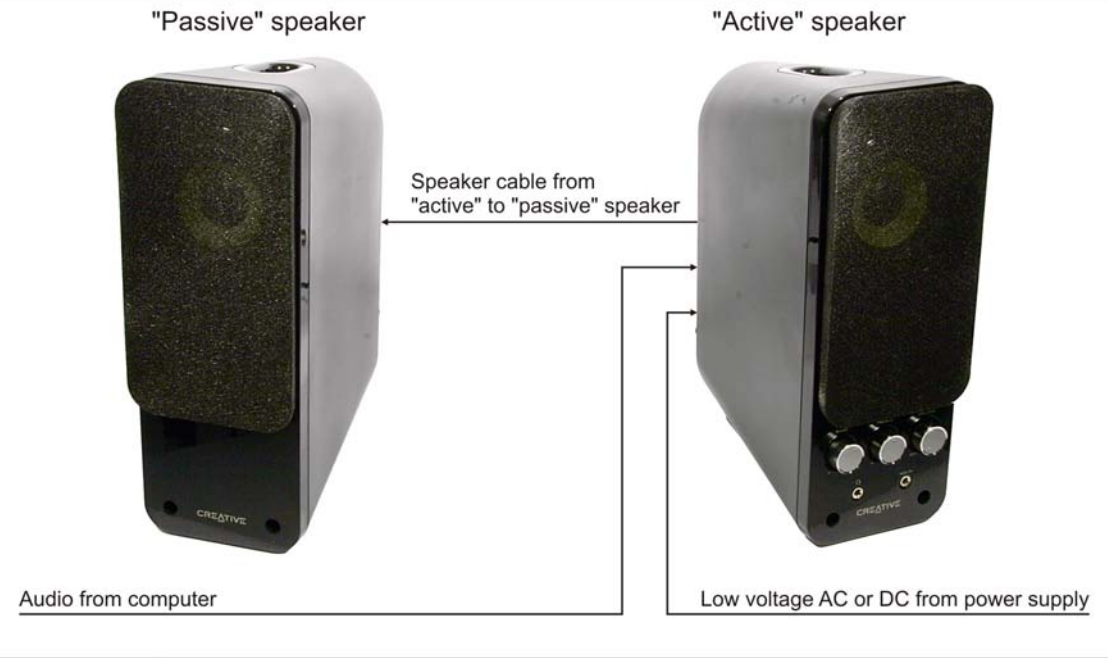


W513A Rev.A	Audio output with commercial cable

Power supply

W513B Rev.A	Power supply for powered speakers

Wiring

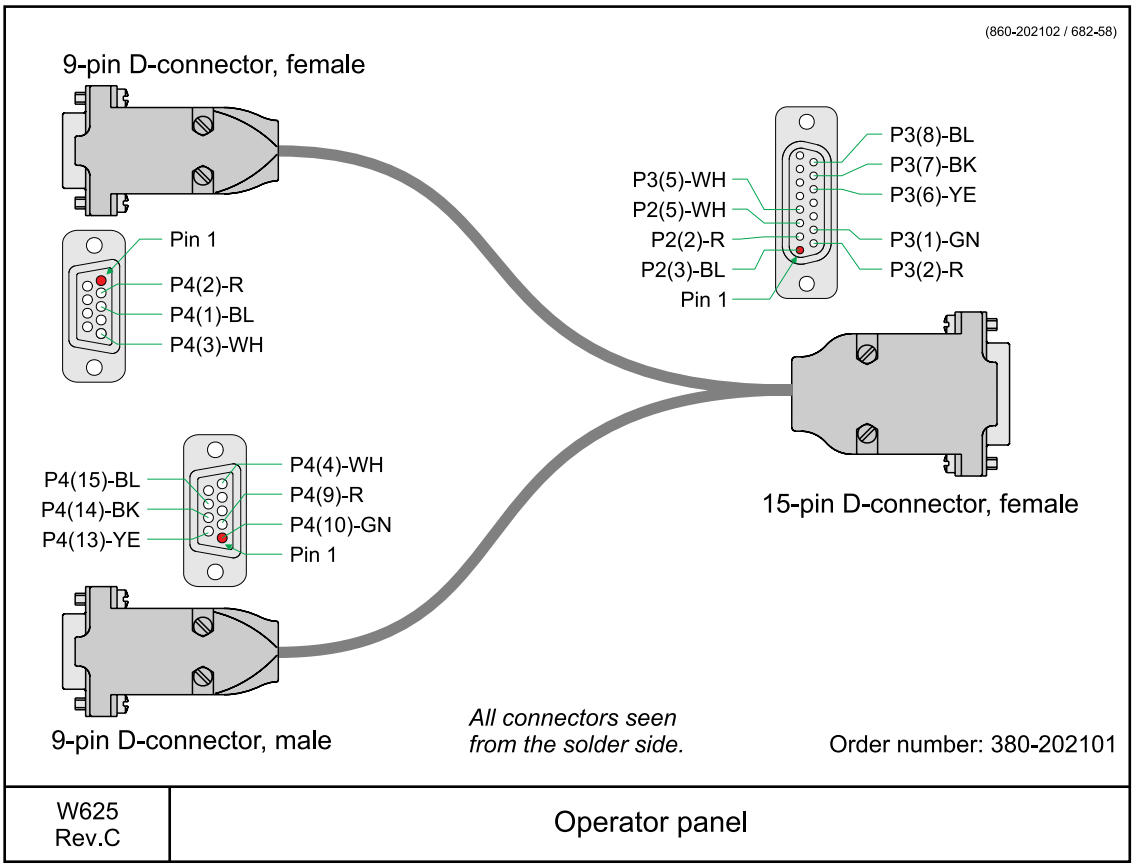


W513C Rev.A	Powered speakers

Operating Panel "Dual"

This cable is used to connect the Operating Panel to the Processor Unit.

- The 15–pin plug connects to the Operating Panel.
- The 9–pin female plug connects to the Processor Unit.
- The 9–pin male plug connects to the Processor Unit.



APPENDIX D — BASIC CABLE REQUIREMENTS

This chapter provides general information related to the installation of system cables.

Topics

- *Cable trays* on page 234
- *Radio Frequency interference* on page 235
- *Physical protection* on page 235
- *Grounding* on page 236
- *Cable connections* on page 236
- *Cable terminations* on page 236
- *Cable identification* on page 237

Cable trays

All permanently installed cables associated with the system must be supported and protected along their entire lengths using conduits and/or cable trays. The only exception to this rule is over the final short distance (maximum. 0,5 meters) as the cables run into the cabinets/units to which they are connected. These short service loops are to allow the cabinets to move on their shock mounts, and to allow maintenance and repair.

- Wherever possible, cable trays must be straight, accessible and placed so as to avoid possible contamination by condensation and dripping liquids (oil, etc.). They must be installed away from sources of heat, and must be protected against physical damage. Suitable shields must be provided where cables are installed in the vicinity of heat sources.
- Unless it is absolutely unavoidable, cables should not be installed across the vessel's expansion joints. If the situation is unavoidable, a loop of cable having a length proportional to the possible expansion of the joint must be provided. The minimum internal radius of the loop must be at least twelve times the external diameter of the cable.
- Where a service requires duplicate supply lines, the cables must follow separate paths through the vessel whenever possible.
- Signal cables must not be installed in the same cable tray or conduit as high-power cables.

- Cables containing insulation materials with different maximum-rated conductor temperatures should not be bunched together (that is, in a common clip, gland, conduit or duct). When this is impractical, the cables must be carefully arranged such that the maximum temperature expected in any cable in the group is within the specifications of the lowest-rated cable.
- Cables with protective coverings which may damage other cables should not be grouped with other cables.
- Cables having a copper sheath or braiding must be installed in such a way that galvanic corrosion by contact with other metals is prevented.
- To allow for future expansion of the system, all cables should be allocated spare conductor pairs. Also, space within the vessel should be set aside for the installation of extra cables.

Radio Frequency interference

All cables that are to be permanently installed within 9 m (30 ft) of any source of Radio Frequency (RF) interference such as a transmitter aerial system or radio transmitters, must, unless shielded by a metal deck or bulkhead, be adequately screened by sheathing, braiding or other suitable material. In such a situation flexible cables should be screened wherever possible.

It is important that cables, other than those supplying services to the equipment installed in a radio room, are not installed through a radio room, high power switch gear or other potential sources of interference. Cables which must pass through a radio room must be screened by a continuous metal conduit or trunking which must be bonded to the screening of the radio room at its points of entry and exit.

Physical protection

Cables exposed to the risk of physical damage must be enclosed in a steel conduit or protected by a metal casing unless the cable's covering (e.g. armour or sheath) is sufficient to protect it from the damage risk.

Cables exposed to an exceptional risk of mechanical damage (for example in holds, storage-spaces and cargo-spaces) must be protected by a suitable casing or conduit, even when armoured, if the cable covering does not guarantee sufficient protection for the cables.

Metallic materials used for the physical protection of cables must be suitably protected against corrosion.

Grounding

All metallic cable coverings (armour, metallic sheathing etc.) must be electrically connected to the vessel's hull at both ends except in the case of final sub-circuits where they should be connected at the supply end only.

Grounding connections should be made using a conductor which has a cross-sectional area appropriate for the current rating of the cable, or with a metal clamp which grips the metallic covering of the cable and is bonded to the hull of the vessel. These cable coverings may also be grounded by means of glands specially intended for this purpose and designed to ensure a good ground connection. The glands used must be firmly attached to, and in good electrical contact with, a metal structure grounded in accordance with these recommendations.

Electrical continuity must be ensured along the entire length of all cable coverings, particularly at joints and splices. In no case should the shielding of cables be used as the only means of grounding cables or units.

Metallic casings, pipes and conduits must be grounded, and when fitted with joints these must be mechanically and electrically grounded locally.

Cable connections

All cable connections are shown on the applicable cable plan and interconnection diagrams.

Where the cable plan shows cable connections outside an equipment box outline, the connections are to be made to a plug or socket which matches the plug or socket on that particular item of equipment.

Where two cables are connected in series via a junction box or terminal block, the screens of both cables must be connected together but not grounded.

Cable terminations

Care must be taken to ensure that the correct terminations are used for all cable conductors, especially those that are to be connected to terminal blocks. In this case, crimped sleeve-terminations must be fitted to prevent the conductor core from fraying and making a bad connection with the terminal block. It is also of the utmost importance that where crimped terminations are used, the correct size of crimp and crimping tool are used. In addition, each cable conductor must have a minimum of 15 cm slack (service loop) left before its termination is fitted.

Cable identification

Cable identification codes corresponding to the cable number shown in the cable plan must be attached to each of the external cables. These identification codes should be positioned on the cable in such a way that they are readily visible after all panels have been fitted. In addition, each cable conductor should be marked with the terminal board number or socket to which it is connected.

APPENDIX E — TELEGRAM FORMATS

All interfaces to and from the Simrad SX90 Sonar are described in detail in this appendix.

Topics

- *About NMEA telegram formats* on page 238
- *Telegrams received and sent by the SX90* on page 239
- *Specification of NMEA telegrams* on page 243
- *Specification of proprietary Simrad telegrams* on page 250
- *Specification of proprietary third party telegrams* on page 258

About NMEA telegram formats

The Simrad SX90 can send and receive information from several different peripherals. All transmissions take place as **telegrams** with data sentences, where each telegram has a defined format and length.

The **NMEA 0183** standard is the most common protocol used for receiving and transmitting sensor data. A parametric sentence structure is used for all NMEA data. The sentence start with a "$" delimiter, and represent the majority of approved sentences defined by the standard. This sentence structure, with delimited and defined data files, is the preferred method for conveying information.

The following provides a summary explanation of the approved parametric sentence structure.

```
$aaccc,c—c*hh<CR><LF>
```

- **"$"**: Start of sentence (Hex: 24).
- **aaccc**: Address field. The first two characters (aa) identifies the "Talker ID", while the last three characters are the "Sentence formatter" mnemonic code identifying the data type and the string format of the successive fields.
- **","**: Field delimiter (Hex: 2C). Starts each field except address and checksum fields. If it is followed by a null field, it is all that remains to indicate no data in the field.
- **c—c**: Data sentence block. This is a series of data fields containing all the data to be transmitted. The data field sentence is fixed and identified by the "Sentence formatter" in the address field. Data fields may be of variable lengths, and they are preceded by the "," delimiter.

- **"*"**: Checksum delimiter (Hex: 2A). Follows the last field of the sentence, and indicates that the following two alphanumerical characters contain the checksum.
- **hh**: Checksum
- **<CR><LF>**: Terminates sentence

For some telegrams received from other Simrad equipment, the **$** character is replaced by the **@** character. The checksum field may not be in use.

Additional information about the NMEA 0183 standard, as well as descriptions of the standard telegram formats, can be obtained in document "NMEA 1083 - Standard for interfacing marine electronic devices". To obtain this document, consult www.nmea.org.

Telegrams received and sent by the SX90

The following telegram formats are either received or transmitted by the peripheral systems connected to the SX90.

Course gyro telegrams

Note

In order to provide its full operational features, the Simrad SX90 must be provided with heading information.

The Simrad SX90 software reads an external course gyro through a serial line using the NMEA 0183 standard for reception of heading information. The sonar accepts the following NMEA heading telegrams:

- *HDT Heading, true* on page 246
- *HDM Heading, magnetic* on page 246
- *HDG Heading, deviation and variation* on page 245
- *VTG Course over ground & ground speed* on page 249
- *RMC Recommended minimum specific GNSS data* on page 247
- *VHW Water speed and heading* on page 249

The **VTG**, **RMC** and **VHW** telegrams are normally provided by other sources than a gyro, but these telegrams also contain heading information. They are therefore supported by the sonar.

Speed log telegrams

Note

In order to provide its full operational features, the Simrad SX90 must be provided with speed log information.

The Simrad SX90 software reads an external speed log through a serial line using the NMEA 0183 standard for reception of the vessel speed. The sonar accepts the following NMEA speed telegrams:

- *VBW Dual ground and water speed* on page 248
- *VTG Course over ground & ground speed* on page 249
- *RMC Recommended minimum specific GNSS data* on page 247
- *VHW Water speed and heading* on page 249

The **RMC** telegram is normally provided by other sources than a speed log, but this telegram also contains speed information. It is therefore supported by the sonar.

GPS telegrams

The Simrad SX90 software reads position information from an external GPS sensor through a serial line using the NMEA 0183 standard for reception of the vessel speed. The system will assume the position to be received in WGS84 datum. The sonar accepts the following NMEA position telegrams:

- *GGA Global positioning system fix data* on page 244
- *GLL Geographical position latitude/longitude* on page 245
- *RMC Recommended minimum specific GNSS data* on page 247

The **ZDA** telegram is also supported, as certain GPS systems provide this time and date information. The sonar does not put this information to use.

- *ZDA Time and date* on page 250

ITI and trawl system telegrams

Thee Simrad SX90 software interfaces trawl systems through a serial line using standard NMEA 0183 telegrams as well as proprietary telegrams based on the NMEA standard. In the proprietary telegrams, the **Start Of Sentence** delimiter **$** is replaced with **@**.

The following trawl systems are supported:

- Simrad ITI
- Simrad FS900

- Simrad FS3300

ITI, FS900 and FS3300. Notice that other can also be sent from an ITI, since telegrams can be routed through this equipment.

ITI

The following telegrams can be received from the Simrad ITI system.

- *TPT Trawl position true vessel* on page 257
- *TPC Trawl position in cartesian coordinates* on page 256
- *GLL Trawl position* on page 251
- *DBS Depth of trawl below surface* on page 250
- *MTW Water temperature at the trawl* on page 253
- *HFB Trawl headrope to footrope and bottom* on page 251
- *TDS Trawl door spread* on page 255
- *TS2 Trawl spread 2* on page 257
- *TFI Trawl filling* on page 255
- *TTS Trawl to shoal distance* on page 257

The **HDM** and **HDT** telegrams are also supported. These telegrams are used by the ITI system, and then exported on the ITI output serial line to external devices.

- *HDM Heading, magnetic* on page 246
- *HDT Heading, true* on page 246

The following telegrams are sent to the ITI system.

- *TPP Tracked target position or marker* on page 256

FS900

The following telegrams can be received from the Simrad FS900 system.

- *DBS Depth below surface* on page 243

FS3300

The serial output of the Simrad FS3300 sends a 2-byte binary depth value. This telegram is thus not compliant to the NMEA standard.

- *FS3300 Binary depth* on page 251

Echo sounder telegrams

The Simrad SX90 software reads depth data from an external echo sounder through a serial line using the NMEA 0183 standard for reception of the water depth. The sonar accepts the following NMEA depth telegrams:

- *DBS Depth below surface* on page 243

- *DBT Depth below transducer* on page 243
- *DPT Depth* on page 244

The sonar will also accept the proprietary **DBS** telegram format.

- *DBS Depth of trawl below surface* on page 250

Wind sensor telegrams

The Simrad SX90 software reads wind data from an external wind sensor through a serial line using the NMEA 0183 standard for reception of wind direction and speed. The sonar accepts the following NMEA wind telegrams:

- *MWD Wind direction and speed* on page 247
- *MWV Wind speed and angle* on page 247
- *VWR Relative (apparent) wind speed and angle* on page 249

Sea current telegrams

The Simrad SX90 software reads water current data from an external water propagation sensor through a serial line using the NMEA 0183 standard for reception of wind direction and speed. The sonar accepts the following proprietary NMEA based telegram from Kaijo, as well as the **Furuno CIF** format from the Furuno CI60 sensor.

- *VDVCD Vector current direction* on page 258
- *Furuno CIF* on page 258

Catch monitoring system telegrams

The Simrad SX90 software reads information from an external catch monitoring system through a serial line using the NMEA based proprietary telegrams for reception of sensor and channel information. The sonar accepts the following proprietary telegram from the Simrad PI catch monitoring systems.

- *PSIMP-F PI Sensor definition* on page 253
- *PSIMP-D PI Sensor data* on page 254

Buoy telegrams

The Simrad SX90 software reads information from an external buoy sensors through a serial line using the NMEA 0183 standard for reception of buoy data. The sonar accepts the following NMEA based proprietary telegrams from the Serpe and Ruokosei sensors:

- *Serpe BSC Buoy input* on page 261
- *Ryokosei RBY Buoy input* on page 262

Target output telegrams

The Simrad SX90 software exports target information through a serial line using the NMEA 0183 standard. The sonar provides the following NMEA based proprietary telegrams containing data associated with a tracked target relative own ship position.

CM60 system

The following telegram is sent to the CM60 system.

- *MDS Measured data shoal* on page 252

On the Simrad SX90 **Installation** menu, this information is controlled by selecting **I/O Setup →Target Output →CM60**.

ITI trawl system

The following telegram is sent to the ITI system.

- *TPP Tracked target position or marker* on page 256

On the Simrad SX90 **Installation** menu, this information is controlled by selecting **I/O Setup →Trawl System →ITI**.

Specification of NMEA telegrams

The NMEA telegrams are listed in alphabetical order. For further information, refer to the NMEA standard provided by the NMEA organisation, or see http://www.nmea.org.

DBS Depth below surface

This telegram provides the current depth. The telegram is no longer recommended for use in new designs.

It is often replaced by the **DPT** telegram.

Format

```
$--DBS,x.x,f,y.y,M,z.z,F*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **DBS** = telegram identifier

3 **x.x,f** = depth below surface in feet

4 **y.y,M** = depth below surface in meters

5 **z.z,F** = depth below surface in fathoms

DBT Depth below transducer

This telegram provides the water depth referenced to the transducer.

Format

```
$--DBT,x.x,f,y.y,M,z.z,F*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **DBT** = telegram identifier

3 **x.x,f** = water depth in feet

4 **y.y,M** = water depth in meters

5 **z.z,F** = water depth in fathoms

DPT Depth

This telegram contains water depth relative to the transducer and offset of the measuring transducer. Positive offset numbers provide the distance from the transducer to the water line. Negative offset numbers provide the distance from the transducer to the part of the keel of interest.

For additional details, refer to the NMEA standard.

Format

```
$--DPT,x.x,y.y,z.z*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **DPT** = telegram identifier

3 **x.x** = water depth, in meters, relative to the transducer

4 **y.y** = offset, in meters, from the transducer

5 **z.z** = maximum range scale in use

GGA Global positioning system fix data

This telegram contains time, position and fix related data from a global positioning system (GPS).

Format

```
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,
x,zz,d.d,a.a,M,g.g,M,r.r,cccc*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **GGA** = telegram identifier

3 **hhmmss.ss** = coordinated universal time (UTC) of position

4 **lll.ll,a** = latitude north/south, position in degrees, minutes and hundredths. Characters **N** (North) or **S** (South) identifies the bearing.

5 **yyyyy.yy,a** = longitude east/west, position in degrees, minutes and hundredths. Characters **W** (West) or **E** (East) identifies the bearing.

6 **x** = GPS quality indicator (refer to the NMEA standard for further details)

7 **zz** = number of satellites in use, 00 to 12, may be different from the number in view

8 **d.d** = horizontal dilution of precision

9 **a.a,M** = altitude related to mean sea level (geoid) in meters

10 **g.g,M** = geoidal separation in meters

11 **r.r** = age of differential GPS data

12 **cccc** = differential reference station identification, 0000 to 1023

GLL Geographical position latitude/longitude

This telegram is used to transfer latitude and longitude of vessel position, time of position fix and status from a global positioning system (GPS).

Format

```
$--GLL,llll.ll,a,yyyyy.yy,a,
hhmmss.ss,A,a*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **GLL** = telegram identifier.

3 **llll.ll,a** = latitude north/south, position in degrees, minutes and hundredths. Characters **N** (North) or **S** (South) identifies the bearing.

4 **yyyyy.yy,a** = longitude east/west, position in degrees, minutes and hundredths. Characters **W** (West) or **E** (East) identifies the bearing.

5 **hhmmss.ss** = coordinated universal time (UTC) of position.

6 **A** = status, characters **A** (data valid) or **V** (data not valid) are used.

7 **a** = mode indicator.

HDG Heading, deviation and variation

This telegram contains the heading from a magnetic sensor, which if corrected for deviation will produce magnetic heading, which if offset by variation will provide true heading.

Format

```
$--HDG,x.x,z.z,a,r.r,a*hh<CR><LF>
```

Heading conversions

- To obtain magnetic heading: Add easterly deviation (E) to magnetic sensor reading, or subtract westerly deviation (W) from magnetic sensor reading.
- To obtain true heading: Add easterly variation (E) to magnetic heading, or subtract westerly variation (W) from magnetic heading.

Format description

1 – – = talker identifier

2 **HDG** = telegram identifier

3 **x.x** = magnetic sensor heading, degrees

4 **z.z,a** = magnetic deviation, degrees east/west

5 **r.r,a** = magnetic variation, degrees east/west

HDM Heading, magnetic

This telegram contains vessel heading in degrees magnetic. The telegram is no longer recommended for use in new designs.

It is often replaced by the **HDG** telegram.

Format

```
$--HDM,x.x,M*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **HDM** = telegram identifier

3 **x.x** = heading in degrees, magnetic

HDT Heading, true

This telegram is used to transfer heading information from a gyro.

Format

```
$--HDT,x.x,T*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **HDT** = telegram identifier

3 **x.x,T** = heading, degrees true

MWD Wind direction and speed

This telegram provides the direction from which the wind blows across the earth's surface, with respect to north, as well as the speed of the wind.

Format

```
$--MWD,x.x,T,y.y,M,z.z,N,s.s,M*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **MWD** = telegram identifier

3 **x.x,T** = Wind direction, true, 0 to 359 degrees

4 **y.y,M** = Wind direction, magnetic, 0 to 359 degrees

5 **z.z,N** = Wind speed in knots

6 **s.s,M** = wind speed in meters/second

MWV Wind speed and angle

This telegram provides the direction from which the wind blows relative to the moving vessel's centre line.

For more information about this telegram format, refer to the NMEA standard.

Format

```
$--MWV,x.x,a,y.y,b*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **MWV** = telegram identifier

3 **x.x** = Wind angle, 0 to 359 degrees

4 **a** = Reference: R = Relative, T = Theoretical

5 **y.y** = Wind speed

6 **b** = wind speed unit: K/M/N/S

RMC Recommended minimum specific GNSS data

This telegram contains time, date, position, course and speed data provided by a global navigation satellite system (GNSS) receiver.

Format

```
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,
x.x,z.z,ddmmyy,r.r,a,a*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **RMC** = telegram identifier

3 **hhmmss.ss** = coordinated universal time (UTC) of position fix

4 **A** = status, characters **A** (data valid) or **V** (Navigation receiver warning) are used.

5 **llll.ll,a** = latitude nort/south. Characters **N** (North) or **S** (South) identifies the bearing.

6 **yyyyy.yy.a** = longitude east/west. Characters **E** (East) or **W** (West) identifies the bearing.

7 **x.x** = speed over ground, knots

8 **z.z** = course over ground, degrees true

9 **ddmmyy** = date

10 **r.r,a** = magnetic variation, degrees east/west. Characters **E** (East) or **W** (West) identifies the bearing.

11 **a** = mode indicator

VBW Dual ground and water speed

This telegram contains water referenced and ground referenced speed data.

Format

```
$--VBW,x.x,z.z,A,r.r,q.q,A,p.p,A,
c.c,A*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **VBW** = telegram identifier

3 **x.x** = longitude water speed, knots

4 **z.z** = transverse water speed, knots

5 **A** = status, water speed, characters **A** (data valid) or **V** (data not valid) are used.

6 **r.r** = longitudinal ground speed, knots

7 **q.q** = transverse ground speed, knots

8 **A** = status, ground speed, characters **A** (data valid) or **V** (data not valid) are used.

9 **p.p** = stern transverse water speed, knots

10 **A** = status, stern water speed, characters **A** (data valid) or **V** (data not valid) are used.

11 **c.c** = stern transverse ground speed, knots

12 **A** = status, stern ground speed, characters **A** (data valid) or **V** (data not valid) are used.

VHW Water speed and heading

This telegram contains the compass heading to which the vessel points and the speed of the vessel relative to the water.

Format

```
$--VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **VHW** = telegram identifier

3 **x.x,T** = heading, degrees true

4 **x.x,M** = heading, degrees magnetic

5 **x.x,N** = speed relative to water, knots, resolution 0.1

6 **x.x,K** = speed relative to water, km/hr, resolution 0.1

VTG Course over ground & ground speed

This telegram contains the actual course and speed relative to the ground.

Format

```
$--VTG,x.x,T,y.y,M,z.z,N,g.g,K,a*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **VTG** = telegram identifier

3 **x.x,T** = course over ground, degrees true

4 **y.y,M** = course over ground, degrees magnetic

5 **z.z,N** = speed over ground, knots, resolution 0.1

6 **g.g,K** = speed over ground, km/hr, resolution 0.1

7 **a** = mode indicator

VWR Relative (apparent) wind speed and angle

This telegram provides the wind angle in relation to the vessel's heading, and the wind speed measured relative to the moving vessel. Note that this telegram format is not recommended for new design. It has been replaced by the **MWV** telegram.

Format

```
$--VWR,x.x,a,y.y,N,z.z,M,s.s,K*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **VWR** = telegram identifier

3 **x.x,a** = Measured wind angle relative to the vessel, 0 to 180 degrees left/right L/R of vessel heading

4 **y.y,N** = measured wind speed in knots

5 **z.z,M** = measured wind speed in meters/second

6 **s.s,K** = measured wind speed in kilometres/hour

ZDA Time and date

This telegram contains the universal time code (UTC), day, month, year and local timer zone.

For further details, refer to the NMEA standard.

Format

```
$--ZDA,hhmmss.ss,xx,yy,zzzz,hh,mm*hh<CR><LF>
```

Format description

1 **– –** = talker identifier

2 **CDA** = telegram identifier

3 **hhmmss.ss** = universal time code (UTC), hours minutes, seconds and tenth of seconds

4 **xx** = day, 01 to 31 (part of UTC)

5 **yy** = month, 01 to 12 (part of UTC)

6 **zzzz** = year (part of UTC)

7 **hh** = local zone hours, 00 to ±13

8 **mm** = local zone minutes, 00 to ±59

Specification of proprietary Simrad telegrams

The telegrams below are designed by Kongsberg Maritime AS to be used in our own fish finding systems. The telegrams are listed in alphabetical order.

DBS Depth of trawl below surface

This proprietary Simrad telegram contains the depth of the trawl sensor.

Format

```
@IIDBS,,,x.x,M,,<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **DBS** = telegram identifier

3 **x.x,M** = depth in meters (0 to 2000)

FS3300 Binary depth

The serial output of FS3300 sends a 2-byte binary depth value. With a measurement in units of 0.1525879 m, the data format is:

Format

```
Osbbbbbb bbbbbbbb
```

Format description

1 **O** = valid output when set

2 **s** = sign bit

3 **bbbbbb bbbbbbbb** = is the 14 bit absolute depth value in units of 0.1525879 m.

GLL Trawl position

This proprietary Simrad telegram provides the geographical position of the trawl sensor.

Format

```
$IIGLLddmm.hh,N,dddmm.hh,W,
hhmmss.ss,A<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **GLL** = telegram identifier

3 **ddmm.hh,N** = Latitude in degrees, minutes and hundredths, N = North, S = South

4 **dddmm.hh,W** = Longitude in degrees, minutes and hundredths, W = West, E = East

5 **hhmmss.ss** = Time

6 **A** = Status

HFB Trawl headrope to footrope and bottom

This proprietary Simrad telegram contains the distance from the headrope to the footrope, and from the footrope to the bottom.

Format

```
@IIHFB,x.x,M,y.y,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **HFB** = telegram identifier

3 **x.x,M** = distance from headrope to footrope, meters

4 **y.y, M** = distance from footrope to bottom, meters

MDS Measured data shoal

This proprietary Simrad telegram contains the location, bearing and depth of a tracked target, all relative to own vessel.

Format

```
$PSIMMDS,hhmmss.ss,ddmmyy,aaaa,A,llll.ll,a,
yyyyy.yy,a,xxxx,M,ppp,P,zzzz,M,vvv.v,N,ttt,D,
wwww,A,ddd,A*aa<CR><LF>
```

Format description

1 **PS** = talker identifier (mandatory)

2 **SIM** = Simrad talker ID

3 **MDS** = telegram identifier

4 **hhmmss.ss** = coordinated universal time (UTC).

5 **ddmmyy** = date (day, month, year)

6 **aaaa** = identification (XXXX)

7 **A** = status, characters **A** (data valid) or **V** (data not valid) are used.

8 **llll.ll,a** = target's latitude position nort/south. Characters **N** (North) or **S** (South) identifies the bearing.

9 **yyyyy.yy.a** = target's longitude position east/west. Characters **E** (East) or **W** (West) identifies the bearing.

10 **xxxx,M** = horizontal range, meters, empty denomination field (,,) indicates an invalid value

11 **ppp,P** = direction to target relative to north, degrees, empty denomination field (,,) indicates an invalid value

12 **zzzz,M** = depth, meters, empty denomination field (,,) indicates an invalid value

13 **vvv.v,N** = target's speed, knots, empty denomination field (,,) indicates an invalid value

14 **ttt,D** = target's course, degrees, empty denomination field (,,) indicates an invalid value

15 **wwww,A** = area, square meters, empty denomination field (,,) indicates an invalid value

16 **ddd,A** = volume, tons, empty denomination field (,,) indicates an invalid value

MTW Water temperature at the trawl

This proprietary Simrad telegram contains the water temperature measured by the trawl sensor.

Format

```
$IIMTW,xx.x,C<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **MTW** = telegram identifier

3 **xx.x,C** = water temperature, degrees Celcius

PSIMP-F PI Sensor definition

This proprietary Simrad telegram contains the type and configuration of PS and PI sensors used by the external PI catch monitoring system.

Format

```
$PSIMP,F,S1,S2,S3,C1,C2,C3,
F1,F2,F3*chksum<CR><LF>
```

Format description

1 **PS** = talker identifier (mandatory)

2 **IMP** = telegram identifier

3 **F** = Sentence specifier

4 **S1,S2,S3** = Sensor types:

- D = Depth 300 m
- E = Depth 600 m
- T = Temperature
- C = Catch slow
- F = Catch fast
- B = Bottom
- N = No sensor

5 **T1,T2,T3** = Telemetry channel numbers for sensors 1, 2 and 3

6 **F1,F2,F3** = Offset values for sensors 1, 2 and 3

7 **chksum** = The check sum field consists of a "*" and two hex digits representing the exclusive OR of all characters between, but not including, the "$" and "*" characters.

PSIMP-D PI Sensor data

This proprietary Simrad telegram contains the type and configuration of PS and PI sensors used by the external PI catch monitoring system.

Note

This description is not complete. For further information, contact Simrad.

Format

```
$PSIMP,D,tt,dd,M,U,S,C,V,Cr,Q,In,SL,NL,G,
Cb,error*chksum<CR><LF>
```

Format description

1 **PS** = Talker identifier (mandatory)

2 **IMP** = Telegram identifier

3 **D** = Sentence specifier

4 **tt** = Time of day

5 **dd** = Current date

6 **M** = Measurement type:

- D = Depth
- T = Temperature
- C = Catch
- B = Bottom
- N = No sensor
- M = Marker

7 **U** = unit; M, f or F for depth measurements, C or F for temperature measurements

8 **S** = source; number (1, 2 or 3) of the sensor providing the current data values

9 **C** = channel; the number (1 to 30) of the communication channel for the current data source

10 **V** = value; the magnitude of the current sensor measurement

11 **Cr** = change rate; the magnitude of the current depth or temperature measurement

12 **Q** = quality:

- 0 = No connection between the sensor and the receiver
- 1 = One or two telemetry pulses are lost, current value is predicted
- 2 = The current data value is reliable

13 **In** = interference:

- 0 = No interference
- 1 = Interference detected

14 **SL** = signal level – the signal level of the telemetry pulse, measured in dB // 1 µPa

15 **NL** = noise level – the average noise level of the current channel, measured in dB // 1 µPa

16 **G** = the current gain; 0, 20 or 40 dB.

17 **Cb** = cable quality:

- 0 = cable is not connected
- 1 = cable is OK
- 2 = a short circuit, or the hydrophone current is too large

18 **error** = error detected – 0 when no error is detected, a number >0 indicates an error condition

19 **chksum** = The checksum field consists of a "*" and two hex digits representing the exclusive OR of all characters between, but not including, the "$" and "*" characters

TDS Trawl door spread

This proprietary Simrad telegram contains the distance between the two trawl doors.

Format

```
@IITDS,x.x,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **TDS** = telegram identifier

3 **x,M** = distance between the two trawl doors, meters

TFI Trawl filling

This proprietary Simrad telegram contains the information from maximum three catch sensors.

Format

```
@IITFI,x,y,z<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **TFI** = telegram identifier

3 **x** = status, catch sensor 1, characters **0** (Off), **1** (On) or **2** (No answer).

4 **y** = status, catch sensor 2 characters **0** (Off), **1** (On) or **2** (No answer).

5 **z** = status, catch sensor 3 characters **0** (Off), **1** (On) or **2** (No answer).

TPC Trawl position in cartesian coordinates

This proprietary Simrad telegram provides the trawl position in cartesian coordinates.

Format

```
@IITPC,x,M,y,M,z,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **TPC** = telegram identifier

3 **x,M** = horizontal distance from vessel centre line in meters

4 **y,M** = horizontal distance from the transducer to the trawl along the vessel's centre line in meters

5 **z,M** = depth of the trawl below the water surface

TPP Tracked target position or marker

This proprietary Simrad telegram contains the true bearing and water depth of the trawl sensor, as well as its distance from the vessel.

Format

```
@SSTPP,xxxx,M,yyy,P,zzzz,M,nn<CR><LF>
```

Format description

1 **SS** = talker identifier (mandatory)

2 **TPP** = telegram identifier

3 **xxxx,M** = horizontal range to the target, meters, resolution 1 m.

4 **yyy,P** = bearing to the target relative to vessel heading, resolution 1 degree

5 **zzzz,M** = target's depth below surface, meters, resolution 1 m

6 **nn** = target identification:

- **00**: echo target being tracked
- **10**: position being tracked
- **20 to 29**: markers 0 to 9
- Note that position telegrams for markers are not be transmitted to the ITI.

TPT Trawl position true vessel

This proprietary Simrad telegram contains the true bearing and water depth of the trawl sensor, as well as its distance from the vessel.

Format

```
@IITPT,x,M,y,P,z.z,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **TPT** = telegram identifier

3 **x,M** = horizontal range to the target.

4 **y,P** = true bearing to the target.

5 **z.z,M** = depth of trawl below the surface.

TS2 Trawl spread 2

This proprietary Simrad telegram contains the distance between the second of two trawl doors in a dual trawl system.

Format

```
@IITS2,x.x,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **TS2** = telegram identifier

3 **x.x,M** = distance between the two trawl doors in meters

TTS Trawl to shoal distance

This proprietary Simrad telegram contains the distance between the trawl sensor to the shoal.

Format

```
@IITTS,x,M,y,M,z,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **TTS** = telegram identifier

3 **x,M** = horizontal distance, in meters, from the trawl to the shoal in a direction normal to the vessel's centre line

4 **y,P** = horizontal distance, in meters, from the trawl to the shoal the direction of the vessel's centre line

5 **z,M** = vertical distance, in meters, from the trawl to the shoal

Specification of proprietary third party telegrams

The telegrams below are designed by third party vendors.

Topics

- *VDVCD Vector current direction* on page 258
- *Furuno CIF* on page 258
- *Serpe BSC Buoy input* on page 261
- *Ryokosei RBY Buoy input* on page 262

VDVCD Vector current direction

This telegram is provided by the Kaijo range of sea current sensors, and provides sea current and depth.

Format

```
$VDVCD,,f,xxx,M,y.y,N,zzz,T,a<CR><LF>
```

Format description

1 **VD** = Talker

2 **VCD** = Telegram identifier

3 **xxx,M** = depth in meters

4 **y.y,N** = speed of sea current in knots

5 **zzz,T** = true direction of sea current in degrees

6 **a** = status:

- A = Valid data
- V = Not valid data

Furuno CIF

This proprietary Furuno telegram format is used to contain information about sea current. The original signal format is a 20 mA current loop, and it needs to be converted to RS-232. The serial port must then be set up using dedicated parameters.

Serial parameters for Furuno CIF

- 4800 baud
- Even parity
- 7 data bits
- 1 start bit
- 2 stop bits

Transmission format

Table 22 Furuno CIF, Transmission format

ASCII	Width	HEX	Comments
STX	1 byte	0x02	Start transmission
(Start loop)			
Data	Refer to the sentence descriptions. Several sentences are contained within one block.		
FS	1 byte	0x1C	Field separator
(End loop)			
FS	1 byte	0x1C	Field separator
ETX	1 byte	0x03	End transmission

Note

The FS field separator immediately prior to the ETX (end transmission) may or may not be present.

Data sentences

Table 23 Furuno CIF, Sentence no. 56: Speed and direction for current layer one

Byte #	ASCII	HEX	Comment
1	5	35	Data no.56
2	6	36	
3	C	43	
4	U	55	
5	R	52	
6	=	3D	
7	1		Current speed x 10 kn
8	2		Current speed x 1 kn
9	.	2E	
10	1		Current speed x 1 kn
11		20	
12		20	
13		20	
14		20	
15	A	41	
16	Z	5A	
17	M	4D	
18	=	3D	

Table 23 Furuno CIF, Sentence no. 56: Speed and direction for current layer one (cont'd.)

Byte #	ASCII	HEX	Comment
19	1		Current direction x 100 deg
20	2		Current direction x 10 deg
21	3		Current direction x 1 deg
22	.	2E	
23	1		Current direction x 0.1 deg
24		20	
25		20	
26		20	

Table 24 Furuno CIF, Sentence no. 66: Current Indicator - Derived ship speed & course

Byte #	ASCII	HEX	Comment
1	6	36	Data no. 66
2	6	36	
3	+ – C		Modes: "+" = ground tracking "–" = water tracking "C" = check data
4	1		Ship speed x 10 kn
5	2		Ship speed x 1 kn
6	3		Ship speed x 0,1 kn
7	1		True course x 100 deg
8	2		True course x 10 deg
9	3		True course x 1 deg
10	4		True course x 0,1 deg
11	1		Ship heading x 100 deg
12	2		Ship heading x 10 deg
13	3		Ship heading x 1 deg
14	4		Ship heading x 0,1 deg

Table 25 Furuno CIF, Sentence no. 76: Depth, speed and direction for each current layer

Byte #	ASCII	HEX	Comment
1	7	37	Data no. 76
2	6	36	
3	1		Layer no. 1 to 3
4	1		Layer depth x 100 m

Table 25 Furuno CIF, Sentence no. 76: Depth, speed and direction for each current layer (cont'd.)

Byte #	ASCII	HEX	Comment
5	2		Layer depth x 10 m
6	3		Layer depth x 1 m
7	+ – C		Modes: "+" = ground tracking "–" = water tracking "C" = check data
8	1		Current speed x 10 kn
9	2		Current speed x 1 kn
10	3		Current speed x 0,1 kn
11	1		Current direction x 100 deg
12	2		Current direction x 10 deg
13	3		Current direction x 1 deg
14	4		Current direction x 0,1 deg
15	0	30/31	Alert: Normal or Abnormal
16	N H		Heading reference: "N" = True north "H" = Ship heading
17	1		Selected averaging time [s] (1 to 5)
18	0 1		Byte 18 to 24: "0" = valid "1" = invalid
19			End of sentence
20			
21			
22			
23			
24			

Serpe BSC Buoy input

This telegram is provided by the **Serpe** buoys to provide the geographical location of the buoy as well as the water temperature it is measuring.

Format

```
$??BSC,bbbb,llll.ll,n,wwwww.ww,
W,tt.t,vv,dd.dd.hh,xx.xx.xx,<CR><LF>
```

Format description

1 **BSC** = buoy telegram identifier

2 **bbbb** = buoy number

3 **llll.ll** = latitude in degrees with decimals

0222.17 corresponds to **2º13.302'**

0220.50 corresponds to **2º12.3'**

4 **n** = latitude flag, values are "n" or "s"

5 **wwwww.ww** = longitude in degrees with decimals

6 **dd.dd.hh** = day, month, hour of the day

7 **tt.t** = water temperature

8 **vv** = battery voltage

9 **xx.xx.xx** = not used

Ryokosei RBY Buoy input

This telegram is provided by the **Ryokosei** buoys to provide the geographical location of the buoy as well as echo sounder information and the water temperature the buoy is measuring.

Format

```
$PRBY,xxx,hhmmss,llll.ll,a,yyyyy.yy,a,
yymmdd,tt.t,a0b0c0d0e0f0g0h0i0,BB.B<CR><LF>
```

Format description

1 **PRBY** = buoy telegram identifier

2 **xxx** = buoy number

3 **hhmmss** = hours, minutes and seconds

4 **llll.ll** = latitude

5 **a** = north/south

6 **yyyyy.yy** = longitude

7 **a** = east/west

8 **yymmdd** = year, month, day

9 **tt.t** = water temperature from 0 to 35.5°C

10 **a0b0c0d0e0f0g0h0i0** = echo sounder data

11 **BB.B** = battery voltage

APPENDIX F — INSTALLATION REMARKS

Use this space to document comments and remarks related to the installation. When the installation has been fully completed, and all functional tests have been performed to full satisfaction, representatives from all parties concerned must sign.

Vessel/Customer:	
Place and date:	
Comments:	

Installation performed by	**Company/Position**	**Date**	**Signature**
Installation accepted by	**Company/Position**	**Date**	**Signature**

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